# A STUDY OF CORRELATION BETWEEN SERUM MALONDIALDEHYDE AND THE CLINICAL SEVERITY OF PSORIASIS

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**ABSTRACT**

**INTRODUCTION**

Psoriasis is the dermatological disorder characterized by hyperproliferation and inflammation of the skin. The free radicals produced by oxidative stress leads to oxidation of polyunsaturated fatty acids resulting in the formation of lipid peroxidation products such as malondialdehyde (MDA) which is a biomarker of oxidative stress.

**MATERIALS AND METHODS**

This was a hospital based case control study which included 50 cases of psoriasis and 50 healthy controls. Serum malondialdehyde was measured by thiobarbituric acid reactivity assay method. For the patients with psoriasis, clinical severity was determined according to Psoriasis Area Severity Index (PASI) score. Data analysis was done using SPSS software version 16.0.

**RESULTS AND DISCUSSION**

Our results showed levels of MDA were significantly increased (P<0.001) in patients with psoriasis as compared to controls. We found a positive correlation between the serum MDA and PASI score. These results supported the proposal that serum MDA level could be helpful in predicting the prognosis of psoriasis and add further support for the involvement of oxidative stress in the pathogenesis of psoriasis.

**CONCLUSION**

Our results indicate that oxidative damage resulting from increased reactive oxygen species production may be involved in the pathogenesis of psoriasis.

**KEYWORDS**

Psoriasis, PASI Score, Reactive Oxygen Species, Malondialdehyde.

**HOW TO CITE THIS ARTICLE:** Ashok V, Divya R, Karthikeyan K. A study of correlation between serum malondialdehyde and the clinical severity of psoriasis. J. Evid. Based Med. Healthc. 2016; 3(24), 1086-1088.

DOI: 10.18410/jebmh/2016/250

**INTRODUCTION:** Psoriasis is the dermatological disorder characterised by hyperproliferation and inflammation of the skin.[1] It mostly affects young or middle-aged adults although no age is exempted. Psoriasis usually presents with erythematous, itchy, thick scaly lesions of skin on palms and soles as common areas. It also affects elbows, knees, scalp and sacral region in symmetrical pattern.[2]

Psoriasis affects about 2% of the general population worldwide.[3] Its prevalence in Indian population is 0.7% with male-female sex ratio of about 2.5:1.[3]

The exact etiological factor for psoriasis is not yet clearly known but genetic factor, trauma, skin infection, drugs, emotional stress, alcohol and smoking, etc. greatly influence the development of psoriasis.[1] Psoriasis is also found to be associated with obesity, hypertension, dyslipidaemia and oxidative stress leading to occlusive vascular diseases, cardiovascular events, arthritis, diabetes and liver diseases.[4,5,6]

*Submission 30-01-2016, Peer Review 15-02-2016, Acceptance 23-02-2016, Published 24-03-2016.*
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*DOI: 10.18410/jebmh/2016/250*

Oxidative stress is a cytopathic consequence of either excessive production of reactive oxygen species (ROS) or defect in its removal by antioxidant defence system or both. Oxidative stress has been related in many disorders like type 2 diabetes mellitus, hypertension, coronary artery disease, hypothyroidism, eclampsia and skin malignancy.[7, 8,9,10]

The free radicals produced by oxidative stress leads to oxidation of polyunsaturated fatty acids resulting in the formation of lipid peroxidation products such as malondialdehyde (MDA). MDA is measured in serum samples as a biomarker of oxidative stress and lipid peroxidation.[6,11,12,13]

The data obtained from a study showed increased levels of MDA[14,15] and significantly decreased levels of glutathione peroxidase (GPX) and superoxide dismutase (SOD) in patients with psoriasis[15] which shows an established state of oxidative stress. Another study showed an interrelationship of serum oxidant antioxidant status with the severity of psoriasis.[16] Certain studies have shown the relationship between oxidative stress and psoriasis which showed increased levels of oxidative stress in more severe psoriasis patients.[17,18]

With this background, we wish to explore the possible interrelationship between the oxidative stress and the clinical severity of psoriasis patients.

**MATERIALS AND METHODS:** This study was conducted in the Department of Biochemistry at Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, in collaboration with the Department of Dermatology. This study was approved by the Institutional Ethics Committee SMVMCH, Pondicherry.

**Type of Study:** Hospital based case control study.
**Sample Size:** 100 subjects. We included 50 cases of psoriasis and 50 healthy controls.

**Inclusion Criteria:**
**Cases:** Patients who were clinically diagnosed to have psoriasis in the outpatient and inpatient ward of Department of Dermatology.
**Controls:** Normal healthy controls, non-psoriatic patients attending outpatient department.

**Exclusion Criteria: Cases:** Psoriasis patients with diabetes mellitus, renal failure, ischaemic heart disease.

Any subjects who refused to give informed consent.

Subjects who fulfilled the inclusion and exclusion criteria were included in the study. After explaining the nature of the study, written consent was obtained from all subjects before collecting blood sample.

**Sample Collection:** Three ml of whole blood was collected from the psoriasis cases and the control group. Then the serum was separated after subjecting the collected blood to centrifugation at 2500 rpm for 5 min. at room temperature. The serum was divided into two aliquots and stored at -20ºC for further analysis.

**Biochemical Analysis:** Estimation of serum total protein was done by Biuret method using kits from JEEV Diagnostics in CHEMWELL autoanalyser, CPC Diagnostics Pvt. Ltd., India. Serum MDA was measured by thiobarbituric acid reactivity assay method of Satoh.

**STATISTICAL ANALYSIS:** All parameters were presented as mean±standard deviation (Mean±SD). Correlation analysis was done with Pearson's method. A p value of less than 0.05 was considered statistically significant.

**RESULTS:** Oxidant status in psoriatic patients was assessed by the evaluation of serum MDA which showed a highly statistically significant increase in MDA in psoriatic patients compared with control subjects (P <0.00) (Table 1). The average PASI score was 15.8 and the minimum value was 1.8 and the maximum value was 48.6.

There was a statistically significant positive correlation between MDA and severity of psoriasis (r=0.94, P <0.00) as presented by PASI score (Table 2). Regression analysis with MDA as a dependent variable showed a linear relationship with duration of psoriasis (Fig. 1).

| | Cases (n=50) | Controls (n=50) | P value |
|---|---|---|---|
| Serum MDA | 6.05±3.57 | 2.77±1.46 | 2.77±1.46 |

***Table 1: Serum Malondialdehyde (MDA) levels in patients with psoriasis and controls***

Data are presented as Mean±SD. *P value≤0.05 is statistically significant. Independent student t test was used to analyse the data. MDA=Malondialdehyde

| Parameters (cases, n=50) | Malondialdehyde | |
|---|---|---|
| | R value | P value |
| PASI score | 0.942 | <0.001* |

***Table 2: Correlation of serum malondialdehyde with PASI score among the cases***

Pearson correlation analysis was performed to analyse the data. *p<0.05 is considered statistically significant. MDA=Malondialdehyde,

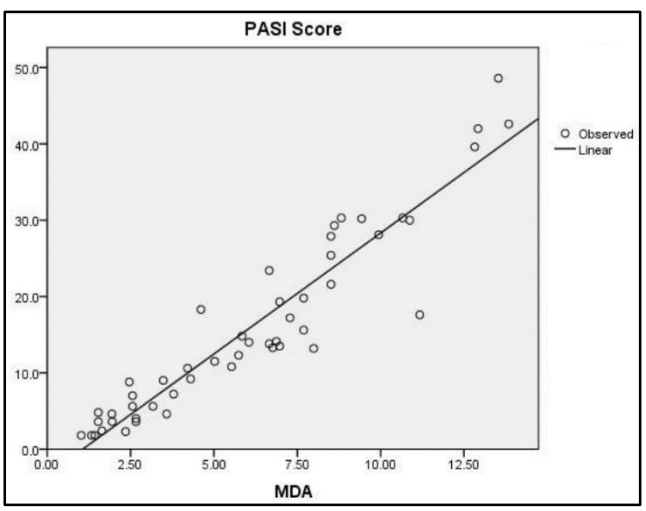


***Fig. 1: Linear regression analysis between serum malondialdehyde and PASI score among the cases***

**DISCUSSION:** Skin is a major target of oxidative stress because of ROS originating from the environment and skin metabolism. Most important ROS are molecular oxygen ($O_2$), superoxide anion ($O_2$-), hydrogen peroxide ($H_2O_2$), hydroxyl radical (OH), nitric oxide (NO), peroxynitrite (ONOO-) and hypochlorous acid (HOCl). In normal aerobic cells, there is a balance between oxidative damage and antioxidant protections. However, inadequate antioxidant potential or excess ROS production creates a condition known as oxidative stress, contributing to the development of cutaneous diseases and disorders.

Psoriasis is a common chronic inflammatory skin disorder and its exact cause remains unknown. Various factors such as environmental and genetic factors, as well as intracellular and intercellular mediators, are thought to play an important role in its pathogenesis. It has been suggested that generation of ROS from neutrophils, keratinocytes and fibroblasts can contribute to neutrophil activation which plays an important role in the psoriatic process. Some believe its pathogenesis is driven by activated T cells or antigen-presenting cells, chemokines and a number of

inflammatory cytokines such as TNF-α, interferon-gamma, interleukin- 1. TNF-α has been shown to cause high levels of inflammatory cytokines and a transcription factor in psoriatic patients. ROS have also been shown to be involved in TNF-α-induced signalling pathways associated with certain inflammatory diseases such as psoriasis.

Increased production of free radicals may cause oxidative damage on biomolecules, cell membranes and tissues. The free radicals induced oxidation of polyunsaturated fatty acids results in the formation of lipid per-oxidation products such as MDA.

Our study indicates an increase in the level of MDA (Table 1) in psoriatic patients as compared to normal controls, which is in correlation with the studies of Rocha P et al,[6] Madhur Gupta et al[15] and Relhan V et al[12] However, Yildrium et al[19] did not find any correlation in the levels of MDA.

Our study provides evidence to increased ROS production, indicated by increased lipid peroxidation in serum. Inactivating the effect of free radicals and stabilization of the cell membrane thus preventing new epidermal destruction can be achieved by antioxidant supplementation, which can be used as a therapeutic approach.

In accordance with the result of Pujari et al[16] we found a positive correlation between the serum MDA and PASI score. However, Baz et al[20] found no statistically significant correlation between the PASI score and serum MDA. These results supported the proposal that serum MDA level could be helpful in predicting the prognosis of psoriasis and add further support for the involvement of oxidative stress in the pathogenesis of psoriasis.

**CONCLUSION:** Our results indicate that oxidative damage resulting from increased reactive oxygen species production may be involved in the pathogenesis of psoriasis and serum MDA level could be helpful in predicting the prognosis of psoriasis.

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