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Brief Communication

Oxidative stress in psoriasis.

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Abstract

Psoriasis is a immune mediated disease that affects skin characterized by hyperproliferation and inflammation of the skin. It is the most common chronic inflammatory skin disease, affecting about 2% of the general population. Skin is a major target of oxidative stress due to reactive oxygen species (ROS). This study was aimed to show that ROS play a significant role in pathogenesis of psoriasis. 40 cases and 40 controls between age group of 25 – 60 were taken. The levels of serum manoldialdehyde (MDA) and nitric oxide (NO) were significantly increased and superoxide dismutase (SOD) and Total Antioxidant Capacity (TAC),estimated by Ferric Reducing Antioxidant Power (FRAP) assay were decreased as compared to normal subjects. This study provides an evidence of an increase in reactive oxygen species (ROS) production and decreased antioxidant defences in psoriasis.

Keywords: Psoriasis, Oxidative stress, FRAP, SOD, MDA

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Introduction

Skin is a major target of oxidative stress due to reactive oxygen species (ROS). Antioxidants attenuate the damaging effects of ROS and can impair and/or reverse many of the events that contribute to excessive growth and reproduction of skin cells. Psoriasis is the most common chronic inflammatory skin disease, affecting about 2% of the general population. The prevalence rates in Europe are quoted to be about 1.5%, whereas in U.S.A., the prevalence is estimated to be about 4.6%. In contrast, lower prevalence rates have been observed in east Africans, American blacks, Indians (0.7%) and among the Chinese populations (0.4%) [1]. The causes of this disease are unknown, though genetic, metabolic, immune and environmental factors have been proposed [2]. The researchers are recently focused on oxidative stress as one of the important factor in pathogenesis of psoriasis [3].

The psoriasis an immune mediated disorder characterized by hyperproliferation and inflammation of the skin, affecting young adults although no age is exempted. The symptoms of the psoriasis are erythema, itching, thickening and scaling of the skin, soles and palms as common areas, also affects elbows, knees, scalps and sacral region in symmetrical pattern [4]. Evaluating oxidative stress in psoriatic patients by measuring lipid peroxidation and TAC can lead to a better understanding of free radical damage in these patients. The comparison of serum MDA and NO (nitric oxide) with serum FRAP and SOD may find its use as an indicator of the progressive follow up in the psoriatic patients and for antioxidant therapy.

Material and Methods

A total of 120 individuals were included in this study, out of these 60 were healthy controls and 60 were newly diagnosed psoriasis patients aged between 25-60 years. The exclusion criteria were patients who were alcoholics or smokers and had past or concurrent diseases like anemia, diabetes mellitus, cardiovascular diseases, liver or kidney diseases, inflammatory skin diseases, patients with any topical therapy within 4 weeks, systemic drug therapy or photo chemotherapy .Informed consent was obtained from each patient before sample collection. From each patient 5 ml blood was collected in sterile vacutainer without adding any additives and then centrifuged. The resulting serum was used for studies.

The serum was analyzed for malondialdehyde (MDA) by colorimetric method [5], nitric oxide (NO) by kinetic cad-

mium reduction method [6], the "total antioxidant capacity by the FRAP assay [7] and superoxide dismutase by modified spectrophotometeric assay (SOD) [8] on the same day. The results were compiled and the statistical analysis was done by using Student *t* test.

Results

The level of serum MDA, NO, SOD, and TAC are presented in Table 1.The level of MDA and NO are significantly higher in cases when compared to controls ($p<0.0001$).The level of SOD and TAC are significantly lower in cases as compared to controls ($p<0.0001$).

Table 1. *Showing values of MDA, NO, TAC, SOD in serum of the psoriatic patients.*

Parameter	Units	Controls	Cases	P value
Number of Subjects	---	60	60	
Serum MDA	µmol/Lit	3.081± 0.20	42.50±6.89	<0.0001
Serum NO	µmol/Lit	72.22.21± 5.93	125.25±8.27	<0.0001
Serum SOD	Units/Lit.	8.89± 0.18	4.28±0.30	<0.0001
Serum TAC	µmol/Lit	1982.86±15.02	1207.85±20.9	<0.0001

Discussion

Psoriasis is considered to be an immune mediated disorder, probably initiated by the overactive skin innate immune system, and maintained by immigrating activated type-1 T cells and abnormally proliferating and differentiating keratinocytes. T cells (which normally help protect the body against infection) become active, migrate to the dermis and trigger the release of cytokines (tumor necrosis factor alpha) TNFα, in particular which cause inflammation and the rapid production of skin cells. A complex network of cytokines and chemokines mediates the pathological reaction, whereas the abnormal function of psoriatic regulatory T cells is likely responsible for the chronic nature of psoriasis [9]. Increased ROS production in patients of psoriasis and decreased concentration of antioxidants leads to oxidative stress, which indicates lipid peroxidation. This may lead to cell damage by continuous chain reactions damaging the cell membranes and tissues. The free radicals induced oxidation of polyunsaturated fatty acids, which results in the formation of lipid peroxidation products such as MDA. Increased ROS production in patients of psoriasis and decreased concentration of antioxidants leads to oxidative stress.ROS may be produced during the inflammatory process, in psoriasis, affecting primarily lipid metabolism of cells. Further, ROS that are produced by lipid peroxidation may activate phospholipase A and thus cause peroxidation of many mediators by arachidonic acid which finally metabolized to MDA Rocha Pereira et al.documented an increased level of MDA in patients with psoriasis as compared to controls, which matched with our findings [3].

Gokhale et al. showed that Nitric oxide levels were significantly increased in patients with psoriasis . Our study also found a similar correlation in the psoriatic patients [11]. NO may be the mediator of inflammation and the driving force behind the pathogenesis. Our findings are consistent with those reported by earlier authors. Expression of iNOS is involved in the pathogenesis of cutaneous inflammation in psoriasis [12]. Increase in mRNA expression of iNOS in skin lesions as compared to uninvolved skin have been reporte [13]. Orem Asim et al. observed that nitrite levels and nitrite–nitrate ratios appear to be good indicators for the increased $NO^{\bullet}$ production in patients and also showed a significant correlation with PASI [14].

SOD, are enzymes that catalyze the dismutation of superoxides (O_2^-) into oxygen and hydroperoxides.Thus, they are an important antioxidant defence in nearly all cells exposed to oxygen . Our study reveals a decrease in the level of SOD in patients with psoriasis as compared to the control. Decreased SOD activity might be related to epidermal hyper proliferation,because the ROS are thought to induce cell proliferation in various cell systems [15]. Increased oxygen metabolism has been described in the psoriatic hyperproliferative epidermis, which depends on cutaneous blood flow. Increased O2•- production in the presence of decreased antioxidant activity would result in the accumulation of H2O2, which has an inhibitory effect on SOD activity [15].

The concentration of plasma FRAP was found to be significantly low in active psoriasis than in inactive psoriasis patients and controls. This decreased concentration of FRAP might either be due to depressed state of antioxidant system or caused as a result of exaggerated inflammatory processes or both. Our study indicates the possibility that, in the pre diagnostic stage, serum antioxidants are low because they have been used in reducing inflammatory products. Antioxidants prevent oxidative injury of structural lipids and proteins contributing to barrier integrity, which is essential for healthy skin condition. This suggests that cellular redox environment plays a pivotal role in skin homeostasis and that skin disease could result from an imbalance between pro-oxidant and antioxidant stimuli [16]

In conclusion, this study provides an evidence that in psoriasis there is an increased ROS production with a concurrent decrease in antioxidant defences. This resulting in-

formation can be used to develop novel strategies for diagnosis, prognosis and treatment of psoriasis. However, as the total number of patients in our study was less, we suggest that more studies involving a greater number of patients are warranted.

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