LETTER TO THE EDITOR
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Evaluation of Glutathione Reductase and Glutathione Peroxidase in the Serum of Iranian Patients with Alopecia Areata: A Case-control Study

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To The Editor

Alopecia areata (AA) is one of the autoimmune diseases in which genetic and environmental factors play a key role.[1] Various hypotheses have been discussed on the cause of this disease. One of these hypotheses is the oxidant/antioxidant imbalance. An imbalance in the proportion of oxidant and antioxidant agents commonly occurs in the emotional, environmental, and autoimmune stresses.[2] A broad antioxidant system is available in the skin. This system comprises an enzymatic and non-enzymatic antioxidant network. Glutathione peroxidase, catalase, and superoxide dismutase are examples of enzymatic antioxidants, while a-tocopherol, ubiquinone, b-carotene, ascorbate, and glutathione are intracellular nonenzymatic antioxidants examples.[3] The cellular redox environment has a major role in skin homeostasis. It balances both oxidant and antioxidant stimulation in skin diseases.[4]

Glutathione, as a potent antioxidant, protects cell components against free radicals and peroxides.[5] Free-radical toxic compounds are usually combined with glutathione and are excreted from the body. Removal of glutathione reductase by reducing the active form of glutathione will lead to the accumulation of free radicals and biochemical damage through lipid oxidation.

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Following lipid peroxidation, adverse consequences occur such as the exchange of ionic permeability and enzymatic activity.[6] Glutathione peroxidase is another enzyme with peroxidase activity whose main biological role is protecting the organisms against oxidative damage, and it can neutralize a wide range of peroxides. Few studies on oxidative stress in AA, with contradictory results, are available.[3,7,8]

Our study was aimed to investigate the activity of glutathione peroxidase and glutathione reductase among AA patients and compare patients with healthy controls. Fifty-six consenting patients were included in our study. The control group included 19 healthy age- and sex-matched individuals. Serum glutathione peroxidase and glutathione reductase activity were measured using the diagnostic kits (Zell Bio GmbH, Germany). The ELISA tests were performed as per the manufacturer's instructions. This study has been evaluated and approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.VCR.REC.1397437) and performed following the Declaration of Helsinki.

The patients included 32 females and 24 males with AA and the control group included healthy 13 females and 6 males. Twenty-eight patients had AA (17 females and 11 males), 9 patients had alopecia totalis (AT) (6 females and 3 males), and 19 (9 females and 10 males) had alopecia universalis (AU). The mean age of patients and healthy controls was 31.05±13.72 and 29.63±6.30 years, respectively (p value>0.05).

The mean and standard deviation of glutathione peroxidase and glutathione reductase activity level in

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patients were 267.22±217.21 and 71.46±54.42, respectively, while the mean and standard deviation of glutathione peroxidase and reductase activity level in healthy individuals were 180.24±89 and 50.99 ±36.9, respectively. None of the differences were significant (p value>0.05, for both).

Mean and standard deviation of glutathione peroxidase activity level in patients with AA, AT, and AU were 246.18±203.82, 322.46±233.75, and 272.05±235.21, respectively (p value>0.05). For glutathione reductase activity the mean and standard deviation in patients with AA, AT, and AU were 83.54±59.98, 85.73±68.79, and 46.89±24.20, respectively (p value>0.05). The mean glutathione reductase activity level in female and male patients was 76.32±54.58 and 64.98±54.69, respectively (p value>0.05). The mean glutathione peroxidase activity level in female and male patients was 324.06±232 and 191.43±172.60, respectively (p value>0.05).

In the present study, the serum levels of glutathione reductase and glutathione peroxidase were not different in patients with AA compared to the control group. However, there is a lot of controversy on the role of antioxidant defense in the pathogenesis of AA among different studies. Some of the studies such as Akar et al showed that in the scalp skin of AA active patients, the activity of superoxide dismutase and glutathione peroxidase increased significantly. It was suggested that the antioxidant defense is not impaired in AA.[7] Others reported lower values of individual antioxidants in AA. The mean serum total antioxidant capacity (TAC) value was shown to be lower in AA cases than in the healthy control group in the Bakry et al study supporting the evidence of defective enzymatic antioxidant activity in AA.[9] Likewise, Kim et al revealed notably lower TAC values in patients in comparison to controls.[10] Naziroglu and Kockam reported that the activity of glutathione peroxidase in both plasma and erythrocytes was notably lower in patients with AA than in the control group. A significantly lower level of Plasma b-carotene was observed in patients with alopecia than in healthy individuals.[3]

Amirnia et al found a significant difference between the levels of zinc and copper and superoxide dismutase (SOD) and malondialdehyde (MDA) in the serum samples of the patients with AA and normal subjects. The level of glutathione peroxidase was significantly lower in these patients than the healthy controls (p=0.001).[11] Gungor et al reported that SOD and glutathione peroxidase levels in the red blood cells decreased and serum lipid peroxidation increased in the patients with AA compared to the healthy controls.[12] Unlike the Gungor and Amirnia study which showed a lower level of glutathione peroxidase in patients with AA compared to the control, our study did not show a significant difference between the two groups.

In conclusion, there is a lot of controversy among different studies. Analysis of various tissues might be a potential reason. It was reported that in different cell types the antioxidant enzyme activity is not identical. Our study is mainly limited by the small sample size. Another limitation of our study was evaluating the serum level of anti-oxidative enzymes without the assessment of these enzymes in skin tissue. Another limitation was not evaluating the severity of AA by the severity of alopecia tool (SALT) score. More studies with larger sample sizes that evaluate the anti-oxidative enzymes and other related items of redox systems from different tissues related to AA are needed to determine the role of antioxidant defense in the pathogenesis of AA.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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