Association of serum levels of zinc and copper with degree of severity in patients with psoriasis

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ABSTRACT

BACKGROUND: Psoriasis is a constant, recurrent, immune related, provocative skin disease. It is non-contagious disorder prominent towards socioeconomic burden on the health care system. Psoriasis affects nearly 2% population of the world. Copper and Zinc are co-factors having role in skin diseases like psoriasis. Some of the trace elements have been related with diagnostic role but studies are limited in scope.

OBJECTIVES: The present study was aimed to correlate serum levels of Zinc and Copper in psoriatic patients with degree of severity and compare with normal healthy individuals.

MATERIAL AND METHODS: The planned study was uni-centric and hospital based consisting of 120 diagnosed cases of psoriasis, grouped as mild, moderate and severe. Forty (n=40) age and sex matched healthy individuals who served as controls for comparison were included in the study. Serum zinc and copper levels were determined by enzymatic colorimetric method (Merck & Germany) and statistical comparison was done by one way ANOVA on SPSS version 16.Value was considered as significant with $p< 0.05$.

RESULTS: Results of present study showed significant decrease in the mean$\pm$SD serum level of zinc in mild, moderate and severe psoriasis groups respectively. While increased serum levels of copper were observed in mild, moderate, and severe psoriasis groups respectively when compared with controls.

CONCLUSION: From the present study outcome it is conclude that increased levels of copper and decreased levels of zinc may be involved to play a key role in psoriasis severity/pathogenesis.

Keywords: *Zinc, Psoriasis, Oxidative Stress, Copper.*

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INTRODUCTION:

Psoriasis is a constant, recurrent, immune related, provocative skin disease. It is non-contagious disorder prominent towards socioeconomic burden on the health care system. The disease is characterized by red plaques having lesions among grey, silvery whitish adherent scales. These lesions are classically distributed symmetrically on the elbows, scalp, knees, joints and lower back, often associated with pruritis[1]. Normally skin cells become mature in a month and shed off replaced by new cells. But in psoriasis, skin cells production become more than normal[2]. Clinically there are many types of psoriasis such as psoriasis vulgaris, guttate psoriasis, erythrodermic psoriasis, pustural psoriasis and psoriatic arthropathy[3]. Psoriasis affects nearly 2% population of the world. World day association reported about 125 million all over the world suffer from it[4]. About 0.15 million fresh psoriatic cases are reported annually. In USA, 4.6% people are affected while lower prevalence rate has been observed in Indians (0.7%). High prevalence rates have been reported in Kazakhistan[5].

Nutritional status of person can affect its immune related problems and resistant to diseases and low levels or elevated levels of these trace element play a key role in pathogenesis[6]. Zinc and copper are important co-factors and play important role in health and disease and alarming awareness that the dietary intake/body levels of these elements may be insignificant in patient with specific disease of entire group or populations. Skin lesion in psoriasis, like other diseases, having an abnormal copper metabolism also cause hyper-pigmentation and morphologic changes to hair as kinky form as in Menkes disease[7].

Thousands of years ago salt of zinc such as zinc oxide/calamine was used topically for wound healing. The main supplies of zinc are oysters, fishes, meat, and cheese. Our skin consumes 1/5th of zinc present in the body[3]. Oxidative stress may be an outcome of abnormal levels of some

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element such as zinc, copper and selenium. Keratin formation and melanin synthesis is enzyme dependent[8]. One the most important element like zinc having a key role in metabolism of nucleic acid, generalized host defense, lymphocytic activity, wound healing, cell mediated immunity, mitosis of cells, stability of living membrane by preventing free radicals which may lead to per oxidation of lipids. Zinc and copper are a part of chief anti-oxidant metaloenzyme i.e., superoxide dismutase (SOD) which is present in mitochondria of cell[9].

Various metal and metal binding protein alter homeostasis of body and is potential marker of target to prevent psoriasis at bio-molecular levels. Copper also having role in development of connective tissue, keratinization, spinal cord myelination and tissue pigmentation, proper output of the Heart. Copper comprised of metaloenzyme have role in electron transfer and binding with molecular oxygen. Metal comprised proteins(enzyme) are known to ameliorate deleterious effect of reactive oxygen species (ROS) by binding to redox active metal such as copper i.e., ROS are produced by this metalvia Fenton reaction. Another copper comprised metaloenzyme, lysyl oxidase properly required for the synthesis of connective tissue. It activity have been related to collagen synthesis during hepatic fibrosis also results an oxidative stress[6].The objective of the present study was to analyze the levels of serum Zn and Cu in psoriatic patients and to compare with normal healthy individuals.

MATERIALAND METHODS:

This planned study was conducted on 120 diagnosed cases of psoriasis patients, with informed consent. These were grouped as mild (n=40), moderate(n=40) and severe(n=40) respectively. Forty (n=40) age and sex matched healthy normal volunteers, served as controls for comparison. The present study was conducted at Department of Biochemistry, at Basic Medical Sciences Institute (BMSI), Jinnah Post Graduate Medical Centre (JPMC) in collaboration with Department of Dermatology, JPMC. An Ethical approval was taken from Ethical Committee of BMSI, JPMC, Karachi, Pakistan.

Informed written consent was obtained from patients having psoriasis. Performa was designed to assemble the base line data concerning our study. These included age, sex, gender, ethnicity, detailed medical history and appropriate investigations as part of the methodology. Age and sex matched healthy individuals were taken from general population for comparison. Diagnosed psoriatic patients were taken from Department of Dermatology JPMC, Karachi, Pakistan. Alcoholics, smokers, hypothyroid, patients suffering from liver, kidney and skin diseases were excluded from the study.

Serum zinc and other copper levels were estimated by atomic absorption Spectrophotometry. The blood samples of the selected subjects who fulfill the inclusion criteria were collected after an overnight (10-12 hours) fast. A pre-defined standard clinical and laboratory criterion was followed for samples collection storage and analysis to avoid any contamination.

RESULTS:

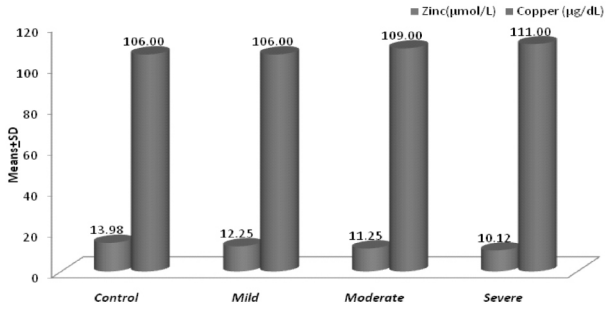
The results shows that Means±SD serum zinc level of severe group was significantly decreased ($p<0.05$) when compared to normal healthy individuals who served as controls. A similar trend in results was observed for moderate psoriatic patients respectivelywhen compared with controls. However an opposite trend in results was observed for serum copper level. It was observed that the level of copper in severe psoriatic group was significantly increased ($p<0.05$) when compared to control subjects. The same was true for mild and moderate psoriatic patients respectively upon comparison with controls (Table & Figure1).

Table1: Comparison of Means ± SD Serum Copper and Zinc levels among the Study Population

Variable	Controls	Psoriasis Patients		
	(n=40)	Mild (n=40)	Moderate(n=40)	Severe(n=40)
Zinc(µmol/L)	13.98 ± 0.18	12.25 ± 0.84$^{\square}$	11.25 ± 0.84$^{\Delta}$	10.12 ± 0.84*
Copper (µg/dL)	106.00±4.64	106.00±4.61	109.00±4.90$^{\Delta}$	111.00±1.10*

($p<0.05$)

Figure-1: Comparison of Means±SD Serum Cu and Zn levels among the Study Groups



DISCUSSION:

Psoriasis is known to be an idiopathic disease. Alterations in keratinocytes proliferation, differentiation and inflammation which may lead to complex interaction and derangement of immune and relating systems of body[10].

In our study we found mean±SD zinc level of severe group was significantly decreased when compared to control, that was below than normal levels. A similar result was reported by Al-Jebory *et al.,*[3]. In contrast to our study Ozturk *et al.,*[11] have reported no significant difference between patients with psoriasis and healthy controls regarding serum zinc level. In contrast to the present study Lee *et al*., (1996)[7] have found no significant difference in mean Cu level of psoriasis when compared to controls. This is in accordance with few studies where elevated levels of serum Cu have been reported in psoriasis and other skin diseases. Increased Cu may be attributable to inflammation associated with the disease.

In our study we found mean copper level of severe group was significantly increased when compared with controls which were above than normal levels. Similar results were reported by Alwasiti and colleagues[8]. The elevation of serum Cu level in psoriasis may be ascribed to an increase in both fractions, especially an increase in ceruloplasmin, a Cu-binding protein, in response to inflammation. Another study[12] demonstrated that serum copper and ceruloplasmin levels were significantly increased in psoriasis. It is still unknown, that whether psoriasis accelerate the release of synthesized protein (ceruloplasmin) into the blood serum or whether the synthesizing capacity is enhanced, or both. New research is required to find out mechanism behind this has yet to be established which account for this increase levels[12].

CONCLUSION:

From the present study outcome it is conclude that increased levels of copper and decreased levels of zinc may be involved to play a key role in psoriasis severity/pathogenesis.

RECOMMENDATIONS:

Zinc, Copper and protein supplementation reduces, inflammations, oxidative stress and proteins deficiency in psoriatic patients.

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