Analysis of Serum Zinc, Protein and Albumin Levels in Psoriasis: A Case Control Study

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ABSTRACT

Psoriasis is a common, chronic, T-cell–mediated inflammatory disease of the skin which has both environmental and genetic components to its etiology. Psoriatic lesions are characterised by hyperproliferation of epidermal keratinocytes and hyperkeratosis, with resultant typical thickening and exfoliation of the erythematous skin .Exfoliation leads to loss of several nutrients from body resulting in deficiency states. So this study is undertaken to have an insight regarding the status of nutrients like zinc, protein and albumin levels in the serum of psoriatic patients. Serum zinc, protein and albumin levels are estimated in 50 newly diagnosed cases of psoriasis not on systemic regime for psoriasis or any other disease and in 50 age and sex matched controls. Descriptive and inferential statistical analysis were performed using SPSS version 17.0. Serum zinc levels are significantly lowered in patients with psoriasis compared to healthy subjects (p<0.05). In the present study, there is also significantly decreased levels of serum Total protein, albumin levels (p<0.05) and reversal of Albumin to Globulin ratio. Loss of protein and zinc through exfoliation and their increased requirement due to altered metabolism suggests adequate supplementation of proteins and zinc to improve the nutritional status and to prevent the complications.

Keywords: *Psoriasis, Nutrition, Zinc ,Total protein and Albumin.*

INTRODUCTION

Psoriasis is a common, chronic, T-cell–mediated inflammatory disease of the skin [1]. The occurrence of psoriasis varied according to age and geographic region, being more frequent in countries more distant from the equator. Prevalence estimates also varied in relation to demographic characteristics in that studies confined to adults reported higher estimates of psoriasis compared with those involving all age groups. The onset of disease usually occurs early in life (ages 15–30 years) and affects males and females equally [2].

Psoriasis has both environmental and genetic components to its etiology [3,4]. It is characterized by varying numbers of red, raised, scaly skin patches that can be present on anybody surface but that most often appear on the elbows, knees, and scalp [1]. The typical erythematosquamous plaque contains histopathological hallmark features that include hyperproliferation of epidermal keratinocytes and hyperkeratosis, as well as infiltration of immunocytes along with angiogenesis, with resultant typical thickening and scaling of the erythematous skin[5]. Mitotic activity of basal keratinocytes is increased by as much as a factor of 50 in psoriatic skin, so keratinocytes need only 3 to 5 days in order to move from the basal layer to the cornified layer (instead of the normal 28 to 30 days [5].This dramatically shortened maturation time is accompanied by altered differentiation, reflected by the focal absence of the granular layer of the epidermis and parakeratosis, or nuclei still present in the thickened cornified layer[5]. The amount of germinative cells increases and the transit time of keratinocytes through the epidermis decreases, causing loss of more cellular material from the surface [6]. Diffuse scaling leads to protein loss of approximately 20-30 g/m2 BSA/day [7]. This amount varies with the underlying diseases, the maximum being in psoriasis followed by drug reactions and eczema [7]. In presence of exudative skin lesions, the combined protein loss through oozing from the skin surface and urine (urinary nitrogen derived from hypercatabolism) may amount to 150-200 g/day [8].High protein loss through scaling in psoriasis is possibly due to high cell turnover which is further exacerbated due to inflammation, when compared to eczema and drug reactions where only inflammatory component plays a major role [9].So this study aims to determine whether the loss of proteins by exfoliation of skin is reflected in the serum protein levels.

Exfoliation also leads to loss of several nutrients from skin lesions in psoriasis. Due to altered metabolism there is an increased demand for various elements involved in hyper proliferation of dermal cells. Zinc is one of essential trace element required for protein synthesis in involved skin. It is present in all cells and is indispensable for the normal functions of cells, tissues and organs of the body [10].It is an integral part of a number of metallo enzymes necessary for normal protein, carbohydrate, lipid and nucleic acid metabolism. [11].The structure and function of cell membranes are also affected by zinc. Loss of zinc from biological membranes increases their susceptibility to oxidative damage and impairs

their function [12]. A finger-like structure, known as a zinc finger motif, stabilizes the structure of a number of proteins [13]zinc insufficiency has been recognized by a number of experts as an important public health issue, especially in developing countries [14]. This study is undertaken in order to determine whether there is significant zinc deficiency in psoriatic patients which will have impact on the disease course.

MATERIALS AND METHODS

The study was conducted in the Dept. of Biochemistry, Osmania General Hospital and Osmania Medical College, Hyderabad, Telangana. Subjects for the study were screened from those patients who attended the service of the Out-Patient Department of Dermatology, Osmania General Hospital.

Cases inclusion criteria:

- 50 patients (age and gender matched) with psoriasis.
- All patients had apparent psoriatic lesions..
- They were not on systemic regime for psoriasis or any other disease.
- In all the selected patients of psoriasis, the PASI score is < 30.

Cases exclusion criteria:

- Patients with history of systemic diseases with chronic T cell activation like pulmonary and pleural Tuberculosis, sarcoidosis etc.
- Patients with diseases that can cause secondary hypoproteinemia such as malnutrition, liver failure, malabsorption

syndromes and hyperthyroidism were excluded.

- Patients with diseases that can cause secondary hyperproteinemia were also excluded.

Controls inclusion and exclusion criteria:

- 50 age and gender matched non psoriatic subjects who were not suffering from any medical or surgical illnesses were included in the study.

Sample collection:

5 ml of venous blood was drawn after an overnight fasting from the psoriatic patients and healthy controls, into a sterile disposable syringe under aseptic conditions. Samples are centrifuged at 3000 rpm for 5 mins and serum was separated within two hours of collection of blood. Care was taken to prevent hemolysis of the samples. Lipemic and icteric samples were discarded.

The following parameters were estimated in both cases and controls:

1. Serum Zinc by NITRO- PAPS method
2. Serum total proteins by BIURET method
3. Serum Albumin by BROMOCRESOL GREEN method

STATISTICAL ANALYSIS

The statistical analysis was performed using SPSS software 17.00 version. The descriptive results are expressed as mean ± S.D., significance of difference between the patients and control group observed and assessed by using the unpaired student `t` test. The p values are expressed along

with mean values and S.D. The p value < 0.05 was considered statistically significant. The results were represented in the form of tables and bar diagrams.

Specificity and sensitivity of the different parameters at best cut off value differentiating changes associated with psoriasis were computed by using ROC curve with the "graph pad prism" software.

Table 1: Mean ± S.Dof Age in Controls and Cases

	Groups	Mean	S.D	' p' Value
AGE	Controls	44.52	10.16	0.93
	Cases	44.7	11.84	

The mean age control is 44.52 and cases is 44.7 as shown in Table 1. Age has no significance in cases compared to controls.

Table 2: Mean ± S.D values of studied parameters in controls and psoriasis cases

Parameter	Controls		Cases	
	Mean	SD	Mean	SD
ZINC (µg/dl)	82.14	15.15	74.06	23.61
T. PROTEIN (g/dl)	7.29	0.47	7.07	0.55
ALBUMIN (g/dl)	4.52	0.4	4.05	0.48
GLOBULIN (g/dl)	2.77	0.37	3.01	0.26
AG RATIO	1.67	0.33	1.35	0.20

The mean values of serum Zinc, Protein, Albumin and AG ratio are lower in cases when compared to controls.

Table No. 3: 't' and 'p' values of parameters between controls and cases

Parameter	t-Value	P-Value
ZINC	2.037	0.044
T. PROTEINS	2.208	0.03
ALBUMIN	5.217	<0.001
GLOBULIN	3.62	<0.001
AG RATIO	5.767	<0.001

The mean values of serum zinc, protein, Albumin and AG ratio are significantly lower in cases when compared to controls.

Table 4:- Reference range of various parameters, mean +/- 2SD

Parameter	Reference range		Sensitivity	Specificity	Diagnostic Efficiency
	U.L	L.L	In %	In %	In %
ZINC (µg/dl)	112.44	51.84	18	100	59
T.PROTEINS (g/dl)	8.23	6.35	10	98	54
ALBUMIN (g/dl)	5.32	3.72	26	96	61
GLOBULIN (g/dl)	3.51	2.03	98	0	51
AG RATIO	2.33	1.01	4	100	52

Among protein parameters, Albumin has highest diagnostic efficiency followed by proteins AG ratio and Globulin. Zinc, an essential trace element has shown diagnostic efficiency of 59%.

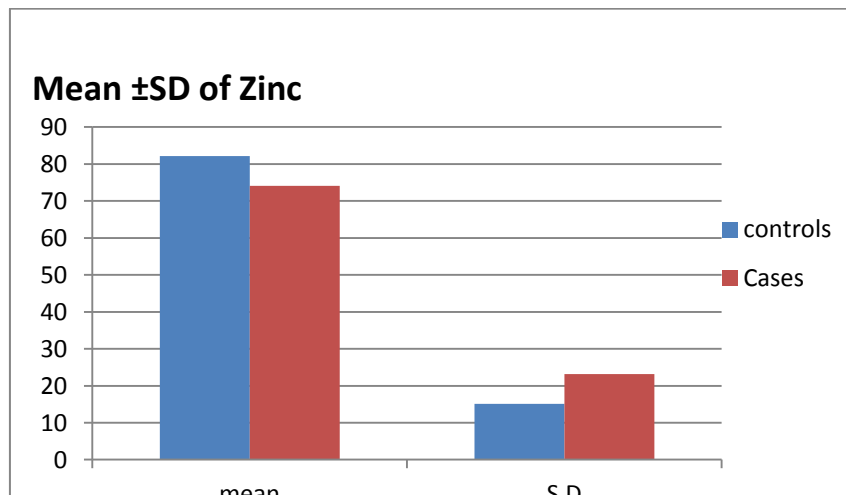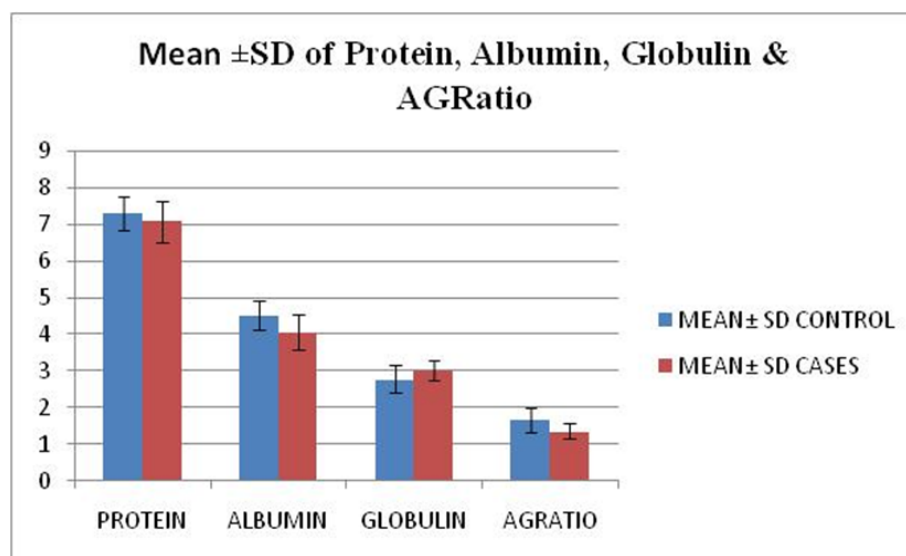**FIG 1** showing Mean ±SD of Zinc among cases and controls

FIG 2 showing Mean ±SD of Protein,Albumun& Globulins among cases and controls

RESULTS

As shown in Table 1, age has no significance in cases compared to controls. As shown in Tables 2 and 3, the mean values for serum zinc, Total proteins and Albumin in cases are low compared to controls and the difference is significant. The mean values for globulin in cases is high compared to controls and the difference is significant. The mean values for AG ratio in cases is low compared to controls and the difference is significant.

In order to assess the utility of various parameters in identifying the abnormality as psoriasis, the reference ranges are calculated by using mean+/- 2SD values of controls as shown in Table 4. The upper limit of reference range of serum Globulin are taken as cut off values in identifying the abnormality. The lower limit of reference range of serum, Zinc, Total Proteins, Albumin, AG ratio are taken as cut off values in identifying the abnormality. Among protein parameters, Albumin has highest diagnostic efficiency followed by proteins, AG ratio and Globulin. Zinc, an essential trace element has shown diagnostic efficiency of 59%.

DISCUSSION

Psoriasis is defined as a common, genetically determined, inflammatory and proliferative disease of the skin, the most characteristic lesions consisting of chronic, sharply demarcated, dull-red scaly plaques, particularly on the extensor prominences and in the scalp .The etiology of this non-contagious disease is still unknown though many a time'sgenetic environmental and immunological mechanisms can be attributed to its cause. The biochemical markers evaluated in the present study were Zinc, Total proteins, Albumin, and Globulin. These parameters were measured in controls and cases and results obtained were statistically analysed by SPSS version 17.0 software.

In the present study, serum Total proteins and serum Albumin levels were significantly decreased in psoriatic patients compared to healthy controls. And Serum Globulin levels were increased significantly in psoriatic patients compared to controls. This is in agreement with the studies of [9,15,16]. According to studies of Walker et al there were no significant abnormalities in Total protein, Albumin, or Globulins

The decrease in total proteins can be attributed due to protein loss through scaling in psoriasis which is due to high cell turn over that is further exacerbated due to inflammation. Protein loss may also occur through gastrointestinal tract. When the protein loss is severe it may result in negative nitrogen balance resulting in hypoalbuminemia, oedema, and loss of muscle mass. Since the disease is chronic the globulins may increase. According to studies of Kanthraj et al [9], serum total protein level is inversely proportional to the amount of protein loss through scaling, and duration of disease. And reversal of albumin to globulin ratio is also seen in the studies of Kanthraj [9].

Zinc is one of the important trace elements related to health and disease. It is an integral part of a number of metallo enzymes necessary for normal

protein, carbohydrate, lipid and nucleic acid metabolism. Serum zinc levels were estimated as zinc is frequently associated with skin lesions. Parakeratosis, an expanded mitotic compartment, and decreased keratohyalin are features common to aberrant epidermal differentiation in psoriasis and in zinc deficient animals. Montgomery described a psoriasis form component as part of the histopathology of the lesions of zinc deficiency in man [17].

The studies yielded conflicting results with lower and normal levels recorded. E.M. McMillan et al suggested that a possible cause for conflicting results might be due to variation in the surface area involvement in individual study groups. They also substantiated the same by observation that those with more extensive involvement have lower zinc levels. In the present study we observed that plasma zinc levels are significantly decreased in psoriasis. The decrease can be attributed to loss of zinc through exfoliation and increased utilization by enzymes required for high cell turnover in psoriatic patients.

To conclude from the present study, loss of protein and zinc through exfoliation suggests adequate supplementation of proteins and zinc to improve the nutritional status and to prevent the complications associated with hypoproteinemia.

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