

# Level of Serum Calcium in Psoriatic Patients

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## Abstract

Various forms of skin disease like psoriasis have been found to show disturbances in systemic calcium metabolism in some cases. Calcium is the major regulator of keratinocytes differentiation. The main objective of this study was to find out the serum calcium level of patients with psoriasis in comparison with control subjects without psoriasis. The present study was a case control study from July 2015 to June 2016. Consecutive type of sampling method was followed in this study. The case group was consisting of 30 psoriatic patients and the control group was consisting of 30 non psoriatic patients attended in Skin and VD department of Dhaka Medical College Hospital (DMCH) and Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. The mean age of the psoriatic group was  $35.57 \pm 7.75$  years (minimum 22 years and maximum 50 years), while it was  $35.17 \pm 7.32$  years (minimum 23 years and maximum 48 years) in the control group. The mean serum calcium level in psoriatic patients was  $8.84 \pm 0.95$  mg/dl (minimum 7.2 mg/dl and maximum 10.2 mg/dl) while in controls it was  $9.49 \pm 0.90$  mg/dl (minimum 7.7 mg/dl and maximum 10.9 mg/dl). Statistical difference was observed between case and control participants with p-value  $< 0.05$ . Hypocalcemia was observed in 33.33% psoriatic patients as compared 10% in controls (P value  $< 0.05$ ). In conclusion, serum calcium levels were lower in psoriatic patients than in control subjects. It is better to include dairy foods as calcium resource in daily diet of patients suffering from psoriasis.

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**Key words:** Psoriasis, homeostasis, calcium in psoriasis.

## Introduction

Psoriasis is a chronic, immune-mediated inflammatory skin disease, associated with metabolic and cardiovascular disease.<sup>1</sup> The etiology of psoriasis is not fully understood, but it appears to be multifactorial involving both genetic and environmental influences.<sup>2</sup> Psoriasis is a chronic, relapsing condition with a 1%-2% prevalence in the general population.<sup>3</sup> Psoriasis is a heterogeneous disease with distinct but overlapping phenotypes. The most frequent ones are chronic plaque (psoriasis vulgaris) and guttate psoriasis.<sup>4</sup> Outbreaks often correlate with environmental triggers, often linked to nutritional deficiencies and poor eating habits.<sup>5</sup> Regular keratinocyte differentiation is crucial for the formation of an intact epidermal barrier and is triggered by extracellular calcium. Disturbances of epidermal barrier formation and aberrant keratinocyte differentiation are involved in the pathophysiology of several skin diseases such as psoriasis.<sup>6</sup> Intracellular calcium plays an important part in the regulation of proliferation and differentiation of keratinocytes.<sup>7</sup> Some cases of various forms of this skin disease have been found to show disturbances in systemic calcium metabolism. Association of

mild hypocalcemia with pustular psoriasis of Von Zumbush, another severe form of psoriasis, has been observed.<sup>8</sup> The present study was conducted to evaluate serum calcium level in patients suffering from psoriasis.

## Methods

The present study was a case-control study. The case group was consisting of 30 psoriatic patients attended in Skin & VD Department of

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Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from July 2015 to June 2016. There were 30 non-psoriatic patients in the control group attended in the same centres. An informed consent was sought from each patient for inclusion in this study. Serum calcium was measured in both groups. 8.2mg/dl - 10.5 mg/dl was considered as normal serum calcium level. SPSS version 16 was used for statistical analysis. The results were expressed as Mean  $\pm$  SD. The chi-square test was used for statistical analysis. The level of statistical significance was set at  $P < 0.05$ . Finally all information including investigation reports were added with the questionnaire.

### Results

Total 60 patients (30 were psoriatic and 30 were non psoriatic) were participated in the study. The mean age of the psoriatic group was  $35.57 \pm 7.75$  years (minimum 22 years and maximum 50 years), while it was  $35.17 \pm 7.32$  years (minimum 23 years and maximum 48 years) in the control group. The mean serum calcium level in psoriatic patients was  $8.84 \pm 0.95$  mg/dl (minimum 7.2mg/dl and maximum 10.2 mg/dl) while in controls it was  $9.49 \pm 0.90$  mg/dl (minimum 7.7 mg/dl and maximum 10.9 mg/dl). Statistical difference was observed between case and control participants with p-value  $< 0.05$ . Below normal level of calcium was observed in 33.33% in psoriatic patients as compared 10% in controls ( $P$  value  $< 0.05$ ).

**Table 1: Distribution of age in cases and controls**

| Age           | Psoriatic patients | Other than psoriatic patients | P value |
|---------------|--------------------|-------------------------------|---------|
| Mean $\pm$ SD | $35.57 \pm 7.75$   | $35.17 \pm 7.32$              | 0.05    |
| Minimum       | 22                 | 23                            | -       |
| Maximum       | 50                 | 48                            | -       |

**Table 2: Serum Calcium levels in cases and controls**

| Calcium level | Psoriatic patients | Other than psoriatic patients | P value |
|---------------|--------------------|-------------------------------|---------|
| Mean $\pm$ SD | $8.84 \pm 0.95$    | $9.49 \pm 0.90$               | 0.05    |
| Minimum       | 7.2                | 7.7                           | -       |
| Maximum       | 10.2               | 10.9                          | -       |

**Table 3: Association of serum calcium between psoriatic patients and other than psoriatic patients**

| Participants                  | Normal calcium / above ( $\geq 8.2$ mg/dl) | Below normal ( $< 8.2$ mg/dl) | Total |
|-------------------------------|--------------------------------------------|-------------------------------|-------|
| Psoriatic patients            | 20 (66.66%)                                | 10 (33.33%)                   | 30    |
| Other than psoriatic patients | 27(90%)                                    | 3 (10%)                       | 30    |
| Total                         | 47                                         | 13                            | 60    |
| $\chi^2 = 4.8, P < 0.05$      |                                            |                               |       |

### Discussion

Psoriasis is categorized as hyper proliferative disease because increase of frequency of epidermal basal cells contributing in mitosis is seen in disease. Several studies have approved the close relation between psoriasis and serum calcium level. Hypocalcemia is responsible for triggering and aggregation of psoriasis. Calcium within the cell plays an important role in the regulation of proliferation and differentiation of keratinocytes. Calcium homeostasis may be involved in the development or exacerbation of psoriasis because hypocalcemia may damage cell adhesion molecules, such as cadherins which were dependent on calcium.<sup>9,10</sup> Hypocalcemic may lead to developing of kinds of generalized pustular psoriasis.<sup>11</sup> It should be remembered that intracellular calcium is kept in mitochondria, reticulum sarcoplasmic and reticulum endoplasmic. Activating cell cytoplasmic membrane receptors lead to release of calcium in cytosol. If concentration of the free intracellular resources or enter the cell actively and through adenosine triphosphatase.<sup>12</sup> Several studies have indicated to calcium role in controlling cellular multiplication and differentiation. According to the results of the present study low level of serum calcium was observed in patients suffering from psoriasis. Additionally, hypocalcemia in the control group is clearly less frequent than case group ( 10% vs 33.33%). The results are in correspondence with other researches. Qadim et al conducted a case-control study. The case group was consisted of 98 psoriatic patients hospitalized at skin clinic of Sina hospital, Tabriz, Iran from

Apr. 2010 to Apr. 2012. There were 100 non-psoriatic patients in the control group hospitalized in the same center. Both groups were the same considering number of males and females and age range and calcium metabolism disorder was not seen in these groups. Calcium levels were measured in both groups and were conducted in biochemical laboratory of Sina Hospital. Considering available kits, normal calcium range of serum was 8.2-10.5 mg dL<sup>-1</sup> with ionized calcium. Out of 98 hospitalized patients, 43 cases (43.8%) suffered from vulgaris psoriasis, 38 cases (38.7%) from dispersed pustular psoriasis, 4 cases (4.08%) from erythrodermic psoriasis and 14 cases (14.2%) from vulgaris psoriasis along with psoriatic arthritis. Considering serum calcium level, the patients were divided into three hypocalcaemia (low calcium serum level), normocalcaemia (normal calcium level) and hypercalcaemia (calcium level higher than normal). In this study, hypercalcaemia was not observed. Out of 98 hospitalized patients, low level of serum calcium was seen in 37 cases (37.2%) but hypocalcaemia frequency was only 9% in the control group. Calcium serum levels were compared considering kinds of psoriasis. As observed, hypocalcaemia frequency is high in more severe kinds of psoriasis (e.g., erythrodermic psoriasis). Fifty seven point one percent of the patients with vulgaris psoriasis along with arthritis had hypocalcaemia since 42.9% of the patients had normal level of calcium.<sup>13</sup>

Stewart et al reported the case of a patient with surgical hypoparathyroidism in whom hypocalcemia precipitated typical pustular psoriasis of von Zumbusch. The psoriasis rapidly cleared on two occasions when the patient's serum calcium was corrected by therapy with oral calcium and vitamin D or its analogues, and reappeared when treatment was discontinued. The patient's psoriasis cleared on a third occasion when her serum calcium level returned to normal with a calcium infusion. Hypocalcemia can precipitate pustular psoriasis of von Zumbusch in susceptible persons. These psoriatic flares are due not to abnormal circulating levels of

parathyroid hormone or vitamin D metabolites but to hypocalcemia.<sup>14</sup> Sreekantha et al was conducted a study in Wenlock and KMC group of hospitals Mangalore and Manipal. 25 freshly diagnosed psoriatic patients were studied in the age group of 30 to 60 years before initiation of any treatment. 25 healthy age and sex matched volunteers were used as controls. Patients and controls were excluded from study if there was evidence of renal, hepatic or thyroid dysfunction and any history of bone lesions, collagen vascular disorders and scurvy. All the patients and controls under treatment with drug that may contribute to change in calcium homeostasis were excluded. Calcium reacts with o-cresolphalein in alkaline solution to form purple colored calcium - o - cresolphalein complex which was read at 600 nm. Statistical analysis was conducted using Mann-Whitney U test. In psoriatic patients calcium (p<0.001) levels were decreased significantly as compared to controls. They concluded from their study that decrease in calcium parameter may be one of the probable causative agents for the pathogenesis of psoriasis.<sup>15</sup>

Our study was limited to a small number of the patients and many studies are needed on a large numbers of patients to prove the role of serum calcium in pathogenesis and association with psoriasis.

### Conclusions

In every patient with psoriasis, serum calcium must be measured. Correction of serum calcium level will help in treatment of psoriasis. It is better to include dairy as calcium resource in daily diet of patients suffering from psoriasis.

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