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Role of Calcium in Psoriatic Patients: A Hospital Based Study

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ABSTRACT

Background

Psoriasis is a common chronic inflammatory skin disease characterized by erythematous papules and plaques with silvery scales. The hyper proliferation and keratinocyte differentiation in psoriasis is controlled by calcium inside the cells and disturbance in the metabolism of calcium has been observed in cases with psoriasis. The aim of this study was to find out the prevalence of deranged serum calcium in patients with psoriasis.

Methods

A cross-sectional study was conducted in the Department of Dermatology, Bir Hospital from June 2019 to December 2020. Any patient presenting at dermatology OPD above 16 years of age with psoriasis were taken as cases. Age and gender matched patients with skin disease other than psoriasis were taken as controls. Determination of serum calcium level was done by fully automated random-access clinical chemistry analyzer Erba Manheim XL-300 in Biochemistry lab, Bir Hospital. The study was approved by the institutional review board. A p-value of <0.05 was considered statistically significant.

Results

Out of 51 cases and 51 controls, low serum calcium level was found in 15(29.41%) of psoriasis patients and 12(23.53%) of the controls. This showed that hypocalcemia was observed more in psoriasis patients than the controls. However, the difference was not statistically significant (p=0.327).

Conclusions

This study showed that hypocalcemia was observed more frequently in cases of psoriasis as compared to controls. However, the finding was not statistically significant.

Keywords: hypocalcemia; psoriasis; serum calcium.

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INTRODUCTION

Psoriasis is a common, chronic, disfiguring, inflammatory and proliferative condition of the skin characterized by red, scaly, sharply demarcated, indurated plaques present particularly over extensor surfaces and scalp.[1] Psoriasis is estimated to affect about 2-4% of worldwide population.[2] The data obtained from Department of Dermatology, Bir Hospital suggests that in the year 2018-2019 AD (2075 BS), a total of 32,395 new patients attended the OPD, out of which 372 (198 males, 174 females) were diagnosed as having psoriasis, which comprises 1.15 % of the total OPD visits.[3] Psoriasis is a T cell dependent autoimmune disease of the skin and joints. Disease manifestation is orchestrated by proinflammatory CD_4-positive T helper cells producing either interferon-gamma (Th1) or interleukin (IL)-17 (Th17).[4] Also, there is increased mitotic activity of the basal cell layer which results in rapid cell turnover with the 28 days normal epidermal cell cycle reduced to 5 days.[5] The normal epidermal barrier results from an equilibrated differentiation process, in which proliferative undifferentiated keratinocytes move from the basal to the granular layer, turning to a differentiated state of cornified envelope.[6] Intracellular calcium plays an important part in the regulation of proliferation and differentiation of keratinocytes and also plays a role in restoration of the epidermal barrier function.[7] Mammalian epidermis displays a characteristic calcium gradient, with low calcium levels in the lower, basal and spinous epidermal layers, whereas calcium levels increase progressively towards the outer stratum granulosum and declining again in the stratum corneum.[8] Calcium ions and their concentration gradient in the epidermis are essential in regulating many skin functions, including keratinocyte differentiation, skin barrier formation and permeability barrier homeostasis.[2] Various forms of psoriasis have been found to show disturbances in systemic calcium metabolism. Association of mild hypocalcemia with pustular psoriasis of Von Zumbush, a rather severe form of psoriasis, has been observed.[1] It has been demonstrated that decreased serum calcium level aggravates psoriasis in most patients.[9] The purpose of this study was to evaluate the level of serum calcium in patients with psoriasis and to see if there is any association.

METHODS

This study was conducted in the Department of Dermatology, Bir Hospital, Kathmandu, Nepal from June 2019 to December 2020 after obtaining ethical clearance from the Institutional Review Board (IRB) of National Academy of Medical Sciences (NAMS) (Ref. no. 364/076/077). A total of 51 diagnosed psoriatic cases and 51 age and sex matched controls were selected after written informed consent. Each subject underwent detailed clinical history, physical examination and systemic examinations as per predesigned proforma after satisfying all inclusion and exclusion criterias. All subjects were sent for analysis of serum calcium level to the Biochemistry lab where about 2 ml of free-flowing venous blood was collected from the antecubital vein without the use of tourniquets. Determination of serum calcium level was done by fully automated random-access clinical chemistry analyzer Erba Manheim XL-300 in Biochemistry lab, Bir Hospital. The test was done using Arsenazo III reagent that combines with calcium ions at pH 6.5 to form a colored chromophore, the absorbance of which was measured at 650 nm, thus calculating the serum calcium concentration. The level of serum calcium calculated by this method was considered normal if in the range of 8.6-10.2 mg/dl. P-value was calculated under the predetermined level of significance (0.05) and Confidence Interval (CI) of 95% was constructed. Results were expressed as percentages, mean ± standard deviation and median for variables.

RESULTS

Fifty-one patients diagnosed with psoriasis were included as cases and the same number of age and sex matched non psoriatic patients with other skin diseases were selected as controls. Out of 51 psoriatic patients, 31 patients (60.78%) were males and 20 patients (39.22%) were females. The male to female ratio was 1.55:1. Age of the patients ranged from 16 to 77 years. Maximum number of cases was found in

the age group 26-35 years. Minimum number of cases was found to be greater than 65 years of age as shown (Table 1).

Table 1. Age & gender distribution of patients. (n=51)

Age	Male n(%)	Female n(%)	Total n(%)
16-25	1(5)	1(5)	9(17.65)
26-35	6(30)	6(30)	12(23.53)
36-45	5(25)	5(25)	11(21.57)
46-55	5(25)	5(25)	10(19.61)
56-65	1(5)	1(5)	5(9.80)
>65	2(10)	2(10)	4(7.84)

Chronic plaque psoriasis was the most common type with 41 (80.39%) cases. Similarly, 6 (11.77%) patients had palmoplantar psoriasis and scalp psoriasis was present in 2 (3.92%) patients. Guttate psoriasis and pustular psoriasis were present only in 1 (1.96%) patients each. And both of them were male patients (Figure 1).

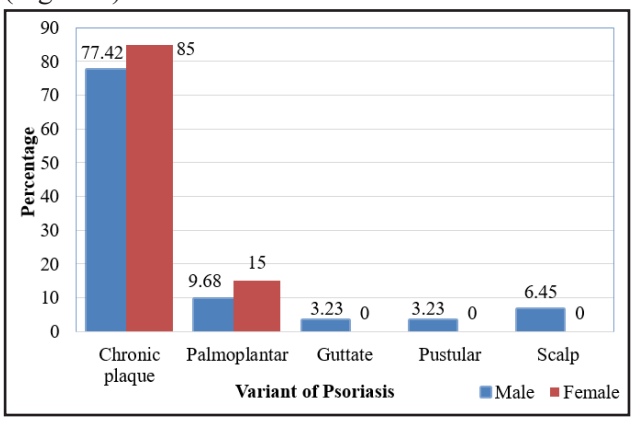

Figure 1. Bar diagram showing Variants of psoriasis in male and female.

Patients with PASI score less than 10 were classified as mild psoriasis, 11-20 as moderate and more than 20 as severe psoriasis.[10] In our study, 74.42% had mild psoriasis, 16.28% had moderate and 9.30% had severe psoriasis (Figure 2).

Out of 51 cases and controls, hypocalcemia was noted in 15 (29.41%) cases and 12 (23.53%) controls. Hypercalcemia was not observed in any of the study subjects. Hypocalcemia was seen to be higher in psoriasis patients than in controls. However, the finding is not statistically significant (P=0.327) (Table 2).

While comparing the variants of psoriasis with serum calcium level, our study showed that 24.39% of the

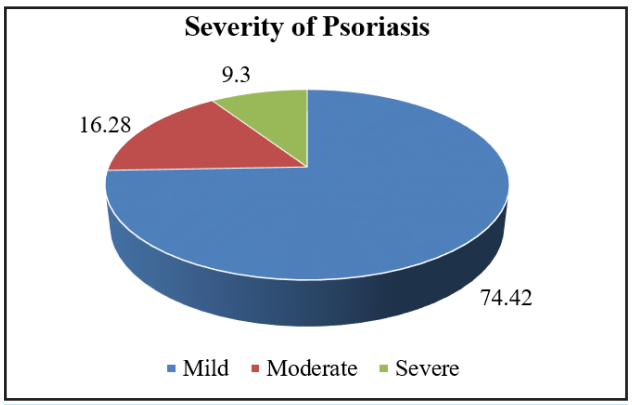

Figure 1. Bar diagram showing Variants of psoriasis in male and female.

Table 2. Comparison of serum calcium level in cases and controls.

Study group	Serum calcium level n(%)			p-value
	Hypo	Normal	Total	
Case	15(29.41)	36(70.59)	51(100)	0.327
Control	12(23.53)	39(76.47)	51(100)	
Total	27(26.47)	75(73.53)	102(100)	

chronic plaque psoriasis patients had low serum calcium level. There were 1 patient each of pustular psoriasis and guttate psoriasis, both of which had low serum calcium level. Out of total 6 patients of palmoplantar psoriasis, 3 had low serum calcium level. None of the patients with scalp psoriasis had abnormal serum calcium level (Table 3).

Table 3. Serum calcium level in variants of psoriasis. (n=51)

Variants of psoriasis	Serum calcium level n(%)		
	Hypo	Normal	Total
Chronic plaque	10 (24.39)	31 (75.61)	41 (100)
Pustular	1 (100)	0 (0)	1 (100)
Guttate	1 (100)	0 (0)	1 (100)
Scalp	0 (0)	2 (100)	2 (100)
Palmoplantar	3 (50)	3 (50)	6 (100)
Total	15 (29.41)	36(70.59)	51 (100)

DISCUSSION

In our study, out of 51 patients, 31 (60.78%) were males and 20 (39.222%) were females with a significantly higher prevalence in males than females. Similar male preponderance was seen in another study with 68.8% men and 31.2% women.[11] In contrast to this, a study among Turkish population by Kundakci et al revealed a slightly higher prevalence in females.[12]

The male to female ratio was 1.55:1 in our context which is consistent with data reported by Bedi et al[13] and Dauden et al.[14] We observed that chronic plaque psoriasis (80.39%) was the most common type of clinical variant followed by palmoplantar psoriasis (11.77%). Scalp psoriasis was present in 3.92% of patients while guttate and pustular psoriasis had similar prevalence (1.96%). These findings were comparable with study done by Hazarika et al in which chronic plaque psoriasis was found in 85% of cases.[15] In another study done by Sampogna et al the most frequent clinical type was generalized plaque psoriasis (57%), followed by localized plaque (13%), guttate (11%), palmoplantar (7%), arthropathic (7%), pustular (3%) and other types of psoriasis (2%).[16]

While evaluating PASI score of the cases, we found that 74.42% of patients had PASI<10 (mild disease), 16.28% of patients had PASI between 11-20 (moderate disease) and 9.30% of patients had PASI >20 (severe disease). Mean PASI was 6.99 in males and 8.22 in females which implies that the disease is more severe in females than males. However, in contrary to our study, study by Hagg et al showed male patients have higher PASI value (mean 7.3) compared to female (mean 5.1).[17]

The main objective of this study was to evaluate the association of serum calcium level in patients with psoriasis in comparison with non-psoriatic patients. The link between psoriasis and serum calcium level has been explored in a large number of studies of varying methodologies in different parts of the world with a large variation in the findings.

In our study out of the total 51 psoriasis patients, low serum calcium level was present in 15 (29.41%) cases while none of the cases had hypercalcemia. The findings were in concordance with the study done in China by YIN et al. where prevalence of hypocalcemia in psoriatic patients was 27.91%.[18] Out of 31 male patients, 10 (32.26%) had hypocalcemia, while out of 20 female patients, 5 (25%) had hypocalcemia. These findings showed low serum calcium level to be more common in males as compared to females. Higher prevalence of hypocalcemia in males as compared to females has also been reported in study done by Qadim et al. (56.8% vs 42.3%)[19]

In our study, low serum calcium level was present in 23.53% among controls and rest of the controls (76.47%) had normal serum calcium level. This finding was contradictory to the study done by Rawat et al. in India where hypocalcemia was observed in only 4% of controls.[20] Among the controls with hypocalcemia in our study, 8 (66.67%) were males and 4 (33.33%) were females.

While comparing serum calcium level among cases and controls, our study showed that prevalence of hypocalcemia was higher in psoriasis patients than in the controls but the difference was not statistically significant (p=0.327). This was consistent with the study done by Qadim et al in Iran in which statistically significant difference was observed in the prevalence of hypocalcemia among psoriasis cases and controls.[19] In contrast, the study done by Nayak et al including 61 cases of psoriasis and 61 controls showed no association in the prevalence of low serum calcium among psoriasis patients (0% vs 3.3%).[21]

The number of patients with chronic plaque psoriasis with hypocalcemia was 10 (24.39%). Half of the patients with palmoplantar psoriasis had hypocalcemia while the remaining half had normal calcium. There were 1 patient each of pustular and guttate psoriasis. It was noteworthy that both of these patients had hypocalcemia. Bijina et al also observed that all of the patients with pustular psoriasis in their study had hypocalcemia.[22] All of the patients with scalp psoriasis had normal serum calcium level.

CONCLUSIONS

Our study tried to link a biochemical disturbance i.e. serum calcium level with a common chronic dermatological condition. It depicted a higher prevalence of hypocalcemia in patients with psoriasis as compared to non-psoriatic controls though the findings were not statistically significant. So, it is better to include calcium resources in the daily life of patients suffering from psoriasis. The sample size was small in comparison to other similar studies so it may have some limitations in generalization of results. The data was collected from only one hospital in a defined period of time so a multicentric study

would have been better. Follow up of the patients with re-investigation of serum calcium level after improvement of psoriasis was not done. This would show if there is any normalization of serum calcium level in patients with the improvement of psoriasis.

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Conflict of interest: None

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