

TRANSDERMAL APPLICATION OF VITAMIN D AND ITS EFFECTS ON PSORIASIS

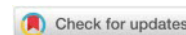
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Abstract: Psoriasis represents a disorder of skin hypoproliferation, where vitamin D is frequently utilized in its treatment. Ultraviolet (UV) radiation stimulates the synthesis of vitamin D₃ (cholecalciferol) in the epidermis. This compound undergoes further conversion into active metabolites, specifically 25-hydroxycholecalciferol and 1,25-hydroxycholecalciferol, which play crucial roles in skin health. However, in conditions like psoriasis, disruptions in skin functioning impede the cutaneous production of vitamin D, initiating a detrimental cycle. This disruption leads to a gradual reduction in vitamin D levels throughout the body, consequently destabilizing skin homeostasis. Topical application of vitamin D enables a substantial reduction in psoriasis on target areas of the body such as the scalp, joints, hands and lumbar region. The research records reductions of 100%, 80%, and 50% in the mentioned regions.

Keywords: vitamin D, psoriasis, participants, scalp, joints, lumbar region, hands

Field: Pharmacoeconomics, Pharmacy

1. INTRODUCTION

Vitamin D, along with its metabolites and analogs, constitutes a group of compounds with various functions in the body. It possesses the ability to dissolve in fat, akin to secosteroids and prohormones. Additionally, vitamin D is found in two primary forms: Vitamin D₂, also known as ergocalciferol, and vitamin D₃, referred to as cholecalciferol (Bocheva et al., 2021). One of its most crucial roles is synthesis within the body, particularly in the skin, where it is synthesized from endogenous cholesterol (7-dehydrocholesterol) under the influence of UV B (290-315 nm) radiation (Pitukweerakul et al., 2019). This synthesis converts vitamin D from its prohormone form into its active form. Subsequently, it undergoes metabolism in the liver, converting into 25-hydroxyvitamin D (25-OH D), with further transformations occurring in the kidneys, resulting in the active form known as calcitriol (1.25 (OH)₂ vitamin D). A deficiency in vitamin D can lead to a disease called psoriasis, a chronic immune-mediated inflammatory skin disorder with a prevalence of 2-3% in the general population (Bhat et al., 2022). It commonly manifests on the skin, although inflammatory processes can occur in other organs. Psoriasis is now recognized as a systemic pathology, encompassing other conditions, ranging from psoriatic arthritis to obesity and metabolic disorders (Brozyana et al., 2022). Dermatological conditions associated with psoriasis are characterized by hyperproliferation of keratinocytes, impaired epidermal barrier function at skin lesion sites, and infiltration of activated inflammatory cells into the skin (Raharja et al., 2021). Various factors contribute to its development, including autoimmune, genetic, hormonal, and psychosomatic factors. Moreover, vitamin D plays a critical role in regulating calcium and phosphorus homeostasis, thereby maintaining the integrity of the skeletal system. The potential efficacy of vitamin D supplementation as an adjunctive treatment option in psoriatic patients remains intriguing yet conservative.

1.2. VITAMIN D CREAM

Vitamin D Cream represents a product by brand „Dr. Pasha“ from Sarajevo. The cream has the following details of patent claim:

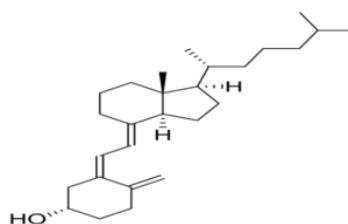
- Cholecalciferol, Vitamin D₃: Ph Eur, BP, USP;
- CAS-br. 67-97-0;
- Molecular formula: C₂₇H₄₄O (Hill) (Figure 1);
- EZ-number 200-673-2;

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Figure 1. Composition of the general formula of Vitamin D3



(Bouillon et al., 2020)

The well-known structure of vitamin D3 is integrated into the cream base, which, due to its composition delivers active substances to the application site. These included: Shea butter, Almond oil and Hydrolyzed oat protein in the form of potassium salts and Xanthan gum, whose composition includes: Agua, Prunus Amygdalus Ducis Oil, Glycerin, Cetearyl Alcohol, Glyceryl Oleate, Butyrospermum Parkii Butter, Glyceryl Stearate, Dehydroacetic Acid, Benzyl Alcohol, Xanthan Gum, Cholecalciferol, Potassium Olivoyl Hydrolyzed Oat Protein, Tocopherol. This cream is intended as dermal support in conditions where there is a need to replenish a deficiency of vitamin D, and it is applied with approximately 1200 IU of vitamin D. It is to be applied to the treated skin twice a day, in the morning and evening, with the aim of delivering an adequate dose of vitamin D to the treated area much faster and more efficiently than would be achieved through oral supplementation.

2. MATERIALS AND METHODS

The transdermal application of vitamin D in subjects with psoriasis lasted for 3 months. The cream was applied twice daily: 1x in the morning and 2x in the evening before bedtime. The total number of participants was 18, with 7 male participants and 11 female participants. Regions affected by psoriasis included the scalp, joints, hands, and lumbar region. All participants (18) had a vitamin D deficiency in their blood, as confirmed by blood test results. The study was conducted using an online survey tool (Google Forms) The survey was conducted anonymously and with strict confidentiality, collecting data on the patients health status and their medical history. Transdermal vitamin D application therapy did not interfere with the routine patient treatment documentation and was carried out with their informed consent. The research complied with the Convention on Human Rights and relevant local regulations concerning patient rights, such as the Law on Rights, Obligations, and Responsibilities of Patients in the Federation of Bosnia and Herzegovina, the Law on Personal Data Protection in Bosnia and Herzegovina, and the Regulation on Health Records in the Federation of Bosnia and Herzegovina.

3. RESULTS

Table 1. displays results for male and female participants with psoriasis, encompassing individuals aged 15 to 45. In the male cohort (N=7), the predominant age range was 15 to 35, with an equal distribution of 3 participants in each subgroup, while only 1 participant fell into the 36-45 category. Among females (N=11), the majority (6) fell within the 26-35 age range, with 5 participants in the 15-25 category. The smallest subset, mirroring the male group, consisted of 2 participants aged 36-45.

Table 1. Application of vitamin D for managing psoriasis in both males and females

<i>The age group of participants</i>	<i>The gender group of the participants</i>			
	Male (N=7)	(%)	Female (N=11)	(%)
from 15-25 age	3	42.85	5	45.45
from 26-35 age	3	42.8	6	54.54
from 36-45 age	1	14.28	2	28.54

(Lekić i Pavlović, 2024)

Within Table 2, the results for predominant regions affected by psoriasis are presented, encompassing the scalp, joints, hands, and lumbar region in both male and female populations. In the male cohort (N=7), the region where psoriasis was most prevalent was joints, observed in 3 participants (42.85%). Additionally, psoriasis was recorded on the hands in 2 participants (28.54%) and in 1 participant each on the scalp and lumbar region (14.25% each). Conversely, among the female population (N=11), a higher number of participants were observed. Psoriasis was predominantly present on the joints in 5 participants (45.45%), making it the most dominant region in this population. Additionally, psoriasis was noted on the scalp, hands, and lumbar region in 2 participants each (18.18%).

Table 2. Regions affected by psoriasis in the male and female populations

Regions affected by psoriasis	The gender of participants			
	Male		Female	
	N=7	%	N=11	%
Scalp	1	14.25	2	18.18
Joints	3	42.85	5	45.45
Hands	2	28.54	2	18.18
Lumbar region	1	14.28	2	18.18

(Lekić i Pavlović, 2024)

Table 3. presents the outcomes for male and female participants with psoriasis across the scalp, joints, hands, and lumbar regions. The table covers a three-month period of vitamin D cream application, documenting the results. In the male cohort (N=7), for the scalp region (1 participant), an 80% reduction in psoriasis was observed (14.25%). Within the joint region (3 participants), psoriasis reduction was noted as 100% in 2 participants and 80% in 1 participant. The hands region exhibited reductions of 100% and 80% in psoriasis for 1 participant each, while the lumbar region recorded a 100% reduction in psoriasis for 1 participant. In the female population (N=11), for the scalp region, an 80% reduction was observed in 2 participants. Within the joints region, reductions were noted as 100% in 2 participants, 80% in 2 participants, and 50% in 1 participant. Results for the hands region indicated reductions in 2 participants, with a 100% reduction in 1 participant and 80% in the other. Lumbar region results documented reductions of 80% in 2 participants.

Table 3. Application of vitamin D cream in male and female participants in the presence of psoriasis

Reduction of inflammatory acne after 3 month of vitamin D application	Gender of participants			
	Male		Female	
	N=7	%	N=11	%
SCALP REGION				
100% reduction	0	/	/	/
80% reduction	1	14.25	2	18.18
50% reduction	0	/	/	/
30% reduction	0	/	/	/
10% reduction	0	/	/	/
No improvement observed	0	/	/	/
JOINTS REGION				
100% reduction	2	28.54	2	18.18c
80% reduction	1	14.25	2	18.18
50% reduction	0	/	1	9.09
30% reduction	0	/	/	/
10% reduction	0	/	/	/
No improvement observed	0	/	/	/
HANDS REGION				
100% reduction	1	14.25	1	9.09
80% reduction	1	14.25	1	9.09
50% reduction	0	/	/	/
30% reduction	0	/	/	/
10% reduction	0	/	/	/
No improvement observed	0	/	/	/
LUMBAL REGION				
100% reduction	1	14.25%	/	/
80% reduction	/	/	2	18.18
50% reduction	/	/	/	/
30% reduction	/	/	/	/
10% reduction	/	/	/	/
No improvement observed	/	/	/	/

(Lekić i Pavlović, 2024)

Figure 2. demonstrates the impact of vitamin D cream on psoriasis-affected areas of the scalp and joints. The findings reveal an 80% decrease in scalp psoriasis and a complete elimination (100%) of psoriasis in the joints region.



(Lekić i Pavlović, 2024)

4. DISCUSSION

Psoriasis is presently recognized as a systemic inflammatory disorder characterized by a comprehensive spectrum of comorbidities, spanning from respiratory disease to cardiovascular diseases. The occurrence of psoriasis ranges from 2-3%, exhibiting noteworthy disparities among diverse ethnic cohorts. The pathogenesis of psoriasis remains a focal point of investigation, with evidence pointing towards susceptible genes, identified triggers, and nutritional data predominantly suggestive of a multifactorial pathogenesis wherein a genetically predisposed susceptibility is activated by a predisposing environmental milieu (Formisano et al., 2023). Literary data indicate a significant prevalence and correlation between psoriasis vitamin D, with the research by Al-Tajer et al. (2022) reporting a decreased level of 25-hydroxy vitamin D in 46 psoriatic cases was 30.5 ± 9.3 vs. 38.3 ± 9.6 ng/ml, where the P was < 0.0001 . Guillet et al. (2022) approximate that psoriasis typically begins at approximately 33 years of age on average. Yet, in younger individuals, psoriasis appears to be more prevalent in males than in females. In females, psoriasis most commonly manifests between the ages of 16 and 22 or between 55 and 60 years. Psoriasis tends to be more prevalent in males aged 30 to 39 and 60 to 79. Studies, such as that by Blegvad et al. (2017), indicate a higher occurrence of psoriasis in females compared to males, particularly among those with autoimmune disorders. However, there is limited literature on the use of vitamin D cream applied to the skin as a primary method for managing and preventing psoriasis, underscoring our pioneering role in this research field. Section 3 of our study presents compelling evidence of the significant effectiveness of vitamin D cream in treating psoriasis. These findings could establish a solid foundation for future investigations into the transdermal application of vitamin D cream for psoriasis management.

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