Climatotherapy at Red Sea, Hurghada, versus topical combination of corticosteroids with salicylic acid in treatment of psoriasis

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Background
The comparison between the efficacy of climatotherapy and the combination of topical steroids with salicylic acid has not been done before. Climatotherapy treatment includes balneotherapy and sun exposure.

Objective
To compare the effectiveness and safeness of climate therapy at Red Sea, Hurghada, with topical corticosteroid and salicylic acid combination therapy for treating chronic plaque psoriasis.

Patients and methods
The work included 30 cases with chronic plaque psoriasis. Patients' age ranged between 9 and 60 years. Cases were classified randomly into two groups, with 15 cases each. Group I was treated with Red Sea climatotherapy (sand bath, bathing in Red Sea water, and sunlight exposure). Group II was treated with topical mix of salicylic acid (3.00%) and corticosteroids (betamethasone dipropionate 0.05%). Psoriasis area and severity index (PASI score), Skindex 16 questionnaire, and histopathological examination of skin biopsies of psoriatic lesions were performed for each patient before and after 3 weeks of treatment.

Results
A marked decrease in PASI score (P = 0.001) and of Skindex 16 (P = 0.009) and a significant difference between histopathological changes were found in cases treated with climatotherapy and in cases treated with topical combination of steroids and salicylic acid but with much more decrease in patients treated with climatotherapy. After treatment, PASI score improved by 80% in 75% of cases in group I and by 50% in 75% of patients in group II.

Conclusion
Climatotherapy is a safe, alternative treatment of psoriasis with low risk, high therapeutic effect, and no adverse effects.

Keywords:
betamethasone dipropionate, climatotherapy, psoriasis area and severity index, psoriasis, the Red Sea, salicylic acid

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Introduction

Psoriasis is a multiorgan disorder with multifactorial pathogenesis [1,2].

Several topical medications for psoriasis are available (corticosteroids, vitamin D3 analogs, salicylic acid, dithranol, etc.) [3].

The basis of climatotherapy is the ability of natural resources to heal [4]. Balneotherapy and sun exposure are included [5].

A combination of salicylic acid and betamethasone dipropionate resulted in faster improvement in psoriatic lesions [6].

The comparison between the efficacy of climatotherapy and the combination of topical salicylic acid with steroids was not performed before.

This work compared the efficiency and safeness of climatotherapy with a topical mix of corticosteroid with salicylic acid to treat chronic plaque psoriasis.

Patients and methods

Study design and ethical consideration

This study is a randomized nonplacebo-controlled prospective clinical trial. All cases were informed of the study procedure, benefits, and potential complications. In addition, an informed consent was collected from

all patients or from their guardians. The registration number of the study is NCT 03156062. The study was approved and monitored by the Medical Ethics and Research Committee of Faculty of Medicine, Assiut University, Egypt (IBR no: 17100098).

Patients

This study included 30 patients with psoriasis vulgaris. Their ages ranged between 9 and 60 years. There were 17 (56.5%) male patients and 13 (43.5%) female patients.

Treatment strategy

Computerized randomization was carried out using a computer-generated randomization schedule. Cases were classified randomly into two groups:

Group I included 15 cases treated with Red Sea climatotherapy.

Group II included 15 (3.00%) cases treated with topical combination of salicylic acid and corticosteroid (betamethasone dipropionate 0.05%) (diprosalic ointment made; Schering-Plough Memphis Co. for Pharmaceutical & Chemical Industry (MEMCO) - Egypt).

Inclusion criteria

The following were the inclusion criteria:

(1) Patients with mild to moderate psoriasis.
(2) Age ranged from 9 to 60 years.

Exclusion criteria

The following were the exclusion criteria:

(1) Patient with severe psoriasis (erythrodermic and pustular psoriasis).
(2) Renal insufficiency.
(3) Skin cancer.
(4) Severe hypertension.
(5) Acute infections.
(6) Skin and systemic diseases worsened by sun exposure.
(7) Acute and unmanaged concurrent illnesses.
(8) Ischemic heart diseases or any other disorders that prevent them from taking a bath.
(9) Patients on any topical or systemic treatment for psoriasis at least 4 weeks before the start of the study.

Methods

Before enrolling in the trial, all patients had a complete history taking process, as well as a general and dermatological assessment.

Full history taking included name, age, sex, occupation, marital status, onset, course, duration, provocation factors, associated systemic disease, previous treatment, and family history of similar conditions. The dermatological examination included site, number and psoriasis area and severity index (PASI) score of psoriatic lesions, nail affection, joint affection, and distribution of lesions.

Treatment protocol for group I

Group I was treated with climatotherapy (sand bath, bathing in Red Sea water, and sunlight exposure).

(1) Sand bath for 5 min at the division of the Ministry, Hurghada, Egypt.
(2) Bathing in Red Sea water (in the period from April to September) with a ranged temperature from 22 to 26°C for 15 min once daily either in the early morning or at 4 p.m.
(3) Gradual exposure to the sun starting from 5 min increased gradually for a maximum duration of 15 min according to skin color (most patients were type III and IV Fitzpatrick's skin phototype). Patients continued treatment once daily for a 3-week duration. Patients were instructed not to use any topical treatments other than emollients (Panthenol cream) while undergoing therapy.

Treatment protocol for group II

Group II was treated by topical application of a mix of salicylic acid (3.00%) (diprosalic ointment) and corticosteroid (betamethasone dipropionate 0.05%) twice daily for a 3-week duration.

Evaluation

(1) Digital photographs by Cannon 600 d, 18 megapixels (Taiwan), were taken for each patient at baseline (before treatment), after 3 weeks (at the termination of therapy), and monthly for at least 3 months of the follow-up period.
(2) PASI score was assessed for each patient before and after treatment. The PASI score is the most popular method for determining the degree of psoriasis, which ranges from 0 (no psoriasis) to 72 (maximal disease). PASI evaluates both the area involved and the severity of lesions [7].
(3) Skindex 16 questionnaires [8] were performed for each patient before and after treatment.
(4) Histopathological examination of biopsied psoriatic skin lesions was performed for each patient before and after treatment with 4-mm punch biopsy (Miltex disposable biopsy punch). Biopsied skin was fixed in formalin, embedded in paraffin, and stained with hematoxylin and eosin for histologic evaluation. Patients were scored according to histologic grading system of psoriasis [9].

Follow-up

Group I was followed up every day for 3 weeks, and class II was followed up weekly for 3 weeks.

After the end of treatment, all cases were followed up monthly for at least 3 months.

Statistical analysis

Using SPSS version 22 (statistical package for the social science, IBM SPSS Inc, Chicago, IL, USA), data entry and analysis were performed. Numbers, percentages, means, and SDs were used to present the data. Fisher's exact, Mann–Whitney, χ^2, Wilcoxon signed-rank test, paired sample *t* test, and independent samples *t* tests were used to compare quantitative and qualitative variables. *P* value was considered statistically significantly less than 0.05. The correlation was done by Spearman correlation.

Results

No statistically significant differences were found between the two groups of patients regarding demographic and clinical data except for provocation factors where three-quarters of studied patients in both classes showed no provocative factors of psoriasis (Table 1).

Regarding the site of psoriasis in the studied cases, more than half of the cases had psoriasis in lower limb, only three patients of group I had psoriasis in trunk, 13 patients had psoriasis in the upper limb, and there were three patients in class I showed psoriasis in two sites, lower limb and trunk.

Most patients of both groups showed normal nails; only one case in group I and four cases in group II revealed onycholysis in nails.

The mean value of the PASI score of group I before treatment was 62.47 ± 33.57, which significantly decreased after 3 weeks of treatment to 21.40 ± 14.63 (Table 2).

However, the mean value of the PASI score of group II before treatment was 47.20 ± 32.08 and significantly decreased after 3 weeks of treatment to 31.20 ± 23.67 [Table 2].

There was a statistically significant decrease in PASI score before and after treatment in the two groups (P = 0.001), with a much more decrease in PASI score in class I [Table 2].

There was a statistically significant decrease in Skindex 16 score after treatment and after 3 months of the follow-up period in patients of both groups but with a much more decrease in group I (Table 3).

Table 1 Demographic and clinical data of the studied patients

	Class I (*n*=15) [*n* (%)]	Class II (*n*=15) [*n* (%)]	*P*
Age (years)			
Mean±SD	33.27±12.23	34.73±13.80	0.633
Median (range)	37.0 (13.0-52.0)	38.0 (14.0-57.0)	
Sex			
Male	8 (53.3)	9 (60.0)	0.713
Female	7 (46.7)	6 (40.0)	
Occupation			
Employee	4 (26.7)	7 (46.7)	
Skilled worker	7 (46.7)	4 (26.7)	0.441
Student	4 (26.7)	4 (26.7)	
Marital status			
Single	5 (33.3)	4 (26.7)	1.000
Married	10 (66.7)	11 (73.3)	
Duration of disease (years)			
Mean±SD	6.33±4.13	5.53±3.54	0.705
Median (range)	5.0 (1.0-15.0)	4.0 (3.0-15.0)	
Provocation factors			
None	7 (46.7)	13 (86.7)	0.020*
Cold	3 (20.0)	2 (13.3)	1.000
Stress	4 (26.7)	0	0.100
Cold and stress	1 (6.7)	0	1.000
Site			
UL	6 (40.0)	7 (46.7)	0.713
LL	9 (60.0)	8 (53.3)	0.713
Trunk	3 (20.0)	0	0.224
Nails			
Normal	14 (93.3)	11 (73.3)	0.330
Onycholysis	1 (6.7)	4 (26.7)	
Joint affection			
Yes	0	0	-
No	15 (100.0)	15 (100.0)	

**P*-value considered statistically significant when $P < 0.05$. χ^2 test. Mann-Whitney test. Fisher exact test.

PASI score improved by 80% in 75% of cases in group I and by 50% in 75% of cases in group II after treatment in our study (Figs. 1 and 2).

No statistically significant correlation was found between PASI score and age or disease duration (Table 4).

No adverse effects were reported after treatment in both groups.

Histopathological examination

Patients were scored according to the histologic grading system of psoriasis [9]. Group I before treatment showed that nine patients had low score and six had high score versus group II before treatment showed that 12 patients had high score and three patients had low score.

After treatment, group I showed that three patients had high score and 12 patients had low score versus

group II after treatment showed 15 patients had a low score.

There was a statistically significant difference between histopathological changes before and after treatment in both groups (Table 5 and Figs. 3–5).

Table 2 Psoriasis area and severity index score of studied patients before and after treatment

PASI score	Class I (*n*=15)	Class II (*n*=15)	*P*1
Before treatment			
Mean±SD	62.47±33.57	47.20±32.08	
Median (range)	64.0 (20.0-133.0)	48.0 (12.0-96.0)	0.194
After 3 weeks			
Mean±SD	21.40±14.63	31.20±23.67	
Median (range)	16.0 (4.0-58.0)	32.0 (8.0-80.0)	0.365
*P*2	0.001*	0.001*	
After 1st month			
Mean±SD	21.87±13.36	32.53±24.56	
Median (range)	18.0 (4.0-49.0)	32.0 (8.0-80.0)	0.312
*P*2	0.001*	0.001*	
After 2nd month			
Mean±SD	22.73±15.68	34.13±25.83	
Median (range)	16.0 (8.0-58.0)	32.0 (8.0-96.0)	0.266
*P*2	0.001*	0.003*	
After 3rd month			
Mean±SD	21.40±14.63	31.20±23.67	
Median (range)	16.0 (4.0-58.0)	32.0 (8.0-80.0)	0.365
*P*2	0.001*	0.001*	

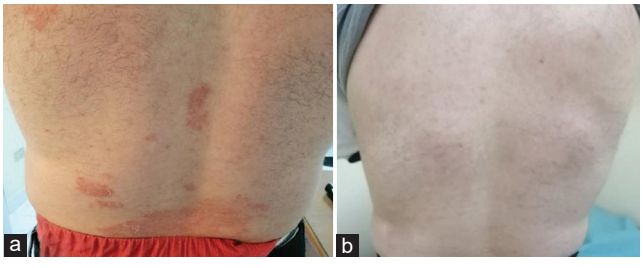
PASI, psoriasis area and severity index. Mann-Whitney test. Wilcoxon signed-rank test. *P*1 value: class I versus class II. *P*2 value: the same class before and after treatment. **P*-value considered statistically significant when $P < 0.05$.

Table 3 Skindex 16 score of studied patients before and after treatment

	Class I (*n*=15)	Class II (*n*=15)	*P*1
Before			
Mean±SD	50.93±6.44	46.80±5.63	0.072
Range	41.0-62.0	38.0-58.0	
After			
Mean±SD	18.33±3.06	22.07±4.10	0.009*
Range	13.0-25.0	17.0-29.0	
*P*2	0.000*	0.000*	

Mann-Whitney test. Wilcoxon signed-rank test. *P*1 value: class I versus class II. *P*2 value: the same class before and after treatment. **P*-value considered statistically significant when $P < 0.05$.

Figure 1



(a) A 40-year-old male patient with psoriasis vulgaris at the back before climatotherapy treatment. (b) The same patient with an excellent improvement after 3 weeks of climatotherapy treatment.

There was a statistically significant positive correlation between the PASI score and the histopathological score of Trozak in both groups ($P < 0.001$ for group I and 0.002 for class II), as the r value of group I was 0.828 and the r value of group II was 0.735.

Recurrence was not observed in group I patients but in four cases of group II after 2 months of follow-up after the completion of treatment.

Discussion

Being a chronic condition, psoriasis affects multiple systems and changes throughout the course of a patient's lifetime [1]. Many factors have been observed to trigger exacerbations, including psychic stress, cold, infections, and trauma [10].

In the current study, more than half of the patients in both groups had psoriasis in the lower limb. The scalp, elbows, knees, and sacral region were the most commonly affected areas by psoriasis. However, these lesions may be more common as a result of a traumatic event [11].

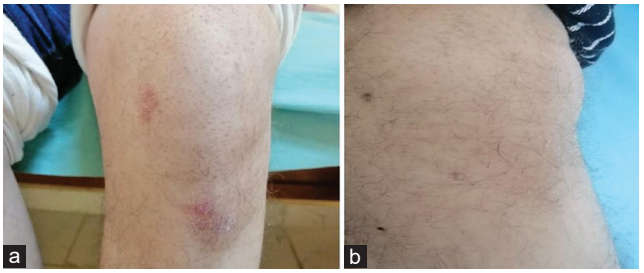
According to our study, more than three-quarters of studied patients showed no provocative factors, which is in contrast to the results of the study by Xhaja *et al.* [12], which reported that more than 70% of patients reported stressful events causing their psoriasis.

Balneotherapy is a successful, safe, supplementary method for treating a variety of illnesses, especially those connected to chronic inflammation like psoriasis [13].

In this study, we compare the efficacy of climatotherapy versus the topical combination of salicylic acid and steroids in treatment of chronic plaque psoriasis.

According to our research, we have shown a significant decrease in PASI score ($P = 0.001$) in cases treated

Figure 2



(a) A 33-year-old male patient with psoriasis vulgaris at the knees before topical combination of steroids with salicylic acid treatment. (b) The same patient with an excellent improvement after 3 weeks of topical combination of steroids with salicylic acid treatment.

with climatotherapy and in cases treated with topical combination of steroids with salicylic acid but with a much more decrease in patients treated with climatotherapy. PASI score improved by 80% in 75% of cases in group I and by 50% in 75% of cases in group II after treatment in our study.

These findings are consistent with the result of Paravina *et al.* [14], who reported that after 4 weeks of climatotherapy treatment, PASI score improved by 46%.

Table 4 Correlation between psoriasis area and severity index score and age or duration of disease

PASI score	Age (years)			
	Class I		Class II	
	r	*P*	*r*	*P*
At start	0.036	0.898	−0.014	0.962
After 3 weeks	0.042	0.881	−0.005	0.987
After 1st month	0.016	0.955	−0.024	0.933
After 2nd month	0.056	0.844	−0.266	0.338
After 3rd month	0.042	0.881	−0.005	0.987
	Duration of disease (years)			
At start	0.449	0.093	0.184	0.510
After 3 weeks	0.333	0.225	0.204	0.467
After 1st month	0.332	0.227	0.190	0.497
After 2nd month	0.327	0.235	0.091	0.748
After 3rd month	0.333	0.225	0.204	0.467

PASI, psoriasis area and severity index. Spearman correlation.

Table 5 Relation between the histopathological changes of psoriasis and the effect of treatment in class I and class II

Scores	Class I (*n*=15)	Class II (*n*=15)	*P*[1]
Before treatment			
Mean±SD	8.27±3.10	11.93±4.86	0.008
Median (range)	7.0 (4.0-12.0)	13.0 (3.0-17.0)	
After treatment			
Mean±SD	5.07±3.10	4.67±2.99	0.950
Median (range)	4.0 (2.0-12.0)	5.0 (0.0-8.0)	
P[2]	0.003*	0.001*	

1: Mann–Whitney test., 2: Wilcoxon signed-rank test. **P*-value considered statistically significant when $P < 0.05$.

Our outcomes are consistent with Kiriakova *et al.* [15], who recorded that full skin lesion regression was noticed in 68% of their cases after 3 weeks of climatotherapy.

Another study by Harrai *et al.* [16], included 64 psoriasis vulgaris cases treated with Dead Sea climatotherapy, and by the end of work, 75.9% of patients achieved improvement of more than 75%.

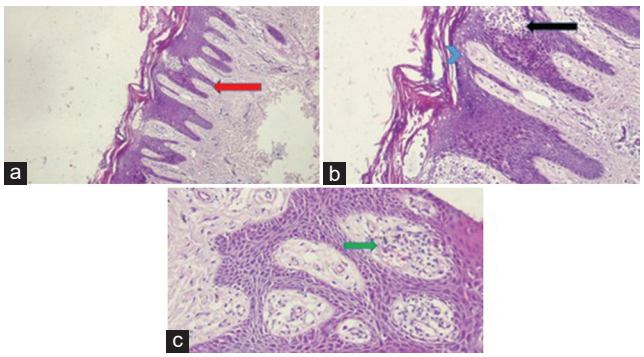
This can be explained by that high mineral concentrations in salty water limit the quantity of cell division, decrease TGF-β (which is elevated in psoriatic sufferers), decrease the Langerhans cells, and decrease mitosis in the skin. Additionally, they function as an enzymatic cofactor and eliminate the yeasts and microbial peptides that cause psoriasis and seborrheic dermatitis [17].

Kiriakova *et al.* [15], discovered that full regression of skin lesions was observed in 68.9% of cases following therapy lasting 20 days, with sunlight exposure of 5–6 min per day and bathing in sea water from 5 to 15 min per day at the Black Sea in Bulgaria. Additionally, 17.1% of patients showed a meaningful enhancement, and 9.5% of cases showed a moderate improvement. However, only 4.5% of cases did not improve after treatment.

In another prospective study by Zoran *et al.* [18], after 4 weeks of treatment at the Dead Sea, 75% of cases displayed full regression of psoriatic lesions after the completion of therapy and 68% of these cases experienced inadequate remission over the following 4 months.

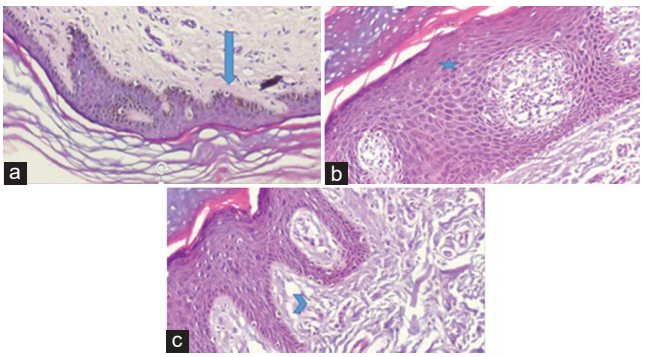
Salinity enhances microcirculation, controls immunological responses, stimulates mast cell function, boosts cytokine production, and lessens the prevalence

Figure 3



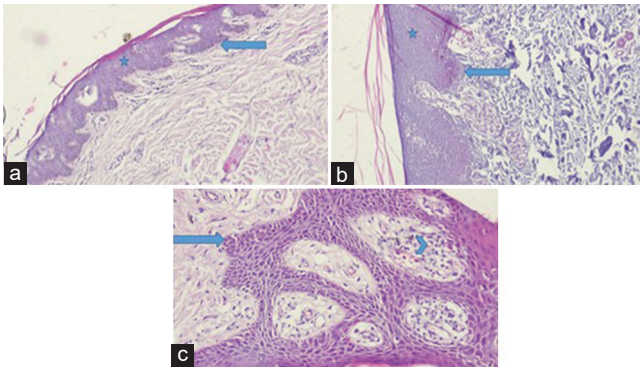
Section from the skin lesion of patients with psoriasis before treatment. (a) Elongated rete ridges (red arrow) (×40). (b) The thinning of suprapapillary plates (arrowhead) and Munro micoabscesses (black arrow) (×100). (c) Perivascular dermal lymphocytic infiltrate (green arrow) (×400).

Figure 4



A section from the skin lesion of patients with psoriasis after climatotherapy treatment. (a) Shortening and blunting of the rete ridges (arrow) (×100). (b, c) Absence of Munro abscess (star) and decrease in the dermal vessels and inflammatory cells (arrowhead) (×400).

Figure 5



Section from the skin lesion of patients with psoriasis after topical combination of steroids with salicylic acid treatment. (a, b, c) Shortening and blunting of the rete ridges (arrow) and thickening of suprapapillary plate (star) (a: ×40, B: ×100, and C: ×200). Perivascular lymphocytic infiltrate still could be detected in C (arrowhead).

of age indicators in addition to reducing skin thickness and inflammation [19].

The human leukocyte elastase enzyme, which is related to psoriasis, is eliminated by the concentrated salt solution [20].

It is also in agreement with Abels *et al.* [21], who reported 100% decrease in PASI score in 88% of his cases after 4 weeks of treatment in Dead Sea.

In a study done by Tiplica and Salavastru [22] on 360 cases that had plaque psoriasis, by the end of treatment, the reduction of PASI score was 44% in the group treated with topical combination of mometasone furoate and salicylic acid, which was statistically significantly greater than the reduction of PASI score in the second group treated with topical corticosteroids alone (37%).

We had no marked correlation between PASI score and age or disease duration. This agrees with Keller and Lin [23], who reported no marked correlation between PASI score and age or disease duration, as psoriasis can begin at any age, but the median age of onset is 28 years.

Moreover, we found a significant decrease in the psoriasis score of Trozak by histologic grading system of psoriasis after treatment by climatotherapy and topical combination of steroids with salicylic acid. There was a statistically significant difference between histopathological changes before and after therapy in both groups.

This agrees with Jenna *et al.* [24], who reported that the histological Trozak score was significantly lower after 3 weeks of treatment, dropping from 10.3 ± 5.5 before treatment to 3.2 ± 4.4 after 3 weeks of balneophototherapy treatment in the Blue Lagoon and from 8.0 ± 4.6 before treatment to 3.7 ± 4.3 after 3 weeks of UVB treatment ($P < 0.05$). Yet, after just 2 weeks of treatment, the histologic score significantly decreased in the balneophototherapy group but not in the UVB alone group.

We noticed a significant positive correlation between PASI score and histological score of Trozak; thus, there is an association between clinical improvement of psoriasis and histopathological changes at level of epidermis and dermis occurred after treatment.

The Dermatology Life Quality Index was the most common used quality of life instrument in psoriasis research, with very few studies using Skindex 16 [25]. In our study, there was a statistically significant reduction in Skindex 16 score after 3 weeks of treatment in patients of the two groups, but with a much more decrease in group I treated with Red Sea climatotherapy. Kopel *et al.*, 2013 [26], reported a marked enhancement in the quality of life of psoriatic cases after Dead Sea climatotherapy using Skindex 29.

Conclusion

Climatotherapy at Hurghada, Red Sea, is more effective than topical application of salicylic acid (3.00%) and corticosteroid (betamethasone dipropionate 0.05%) in treatment of chronic plaque psoriasis. Climatotherapy is a safe alternative treatment of chronic plaque psoriasis as it is a natural, highly effective, and low-cost therapeutic modality with no adverse effects.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Menter A, Gottlieb A, Feldman SR. Guidelines of care for the management of psoriasis and psoriatic arthritis: section 1. Overview of psoriasis and guidelines of care for the treatment of psoriasis with biologics. J Am Acad Dermatol 2008; 58:826–850.

2 Capon F, Meglio P, Szaub J, Prescott N, Dunster C, Baumber L. Sequence variants in the genes for interleukin-23 receptor (IL23R) and its ligand (IL12B) confer protection against psoriasis. Hum Genet 2007; 122:201–206.

3 Naldi L, Griffiths CE. Traditional therapies in the management of moderate to severe chronic plaque psoriasis: an assessment of the benefits and risks. Br J Dermatol 2005; 152:597–615.

4 Kazandgieva J, Grozdev I, Darlenski R, Tsankov N. Climatotherapy of psoriasis. Clinical Dermatology 2008; 26:477-485.

5 Karadaglic DJ, Brick S. Palmoplanter pustulosis is there any progress in the treatment. Serb J Dermatol Venereol 2011; 3:101–108.

6 Guenther LC. Fixed dose combination therapy for psoriasis. Am J Clin Dermatol 2004; 5:71–77.

7 Frediksson T, Pattersson U. Severe psoriasis oral therapy with a new retinoid. Dermatologica 1978; 157:238–244.

8 Chren MM, Lasek RJ, Quinn LM, Mostow EN. Skindex, a quality-of-life measure for patients with skin disease: reliability, validity, and responsiveness. J Investig Dermatol 1996; 107:707–713.

9 Trozak DJ. Histologic grading system for psoriasis vulgaris. Int J Dermatol 1994; 33:380–381.

10 Gudjonsson JE, Elder JT. Psoriasis. In: Wolff K, Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, editors. Fitzpatrick's dermatology in general medicine. 8th ed Singapore: The McGraw-Hill Companies; 2012. 197–231.

11 Gudjonsson JE, Elder JT. Chapter 18. Psoriasis. In: Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, Wolff K. eds. Fitzpatrick's Dermatology in General Medicine, 8e. McGraw Hill; New York 2008; 169-194.

12 Xhaja A, Shkodarni E, Frangaj S, Kuneshka L, Vasili E. An epidemiological study on trigger factors and quality of life in psoriatic patients. Mater Sociomed 2014; 26:168–171.

13 Nasermoaddeli A, Kagamimori S. Balneotherapy in medicine: a review. Environ Health Prev Med 2005; 10:171–179.

14 Paravina M, Stepanović M, Racić G. Balneotherapy effectively acts on symptoms of psoriasis vulgaris. Central East Eur Dermatol Venereol Assoc Bull 2002; 4:70–72.

15 Kiriakova N, Etugov D, Popov J Kazandjieva J. Thaalassotherapy of psoriatic patients in Bulgaria. CEDVA Bull 2002; 4:67 – 69.

16 Harrai M, Czarnowicki T, Fluss R, Ruzicka T, Ingber A. Patients with early onset psoriasis achieve better results following Dead Sea climatotherapy. J Eur Acad Dermatol Venereol 2011; 10:1468.

17 Cattaneo A, Violetti S, Tavecchio S, Bruni E, Carrera C Crosti C. Tomesa balneophototherapy in mild to severe psoriasis: a retrospective clinical trial in 174 patients. Photodermatol Photoimmunol Photomed 2012; 28:169–171.

18 Zoran G, Marina J Biljana J. Balneotherapy of psoriasis. Serb J Dermatol Venereol 2014; 6:105–112.

19 Golusin Z, Jovanovic M, Magda N, Stojanovic S, Matic M, Petrovic A. Effects of Rusanda Spa balneotherapy combined with calcipotriol on plaque psoriasis. Vojnosanit Pregl 2015; 72:1010–1017.

20 Dawe R, Yule S, Cameron S, Moseley H, Ibbotson S, Ferguson J. A randomized controlled comparison of the efficacy of Dead Sea salt balneophototherapy vs. narrowband ultraviolet B monotherapy for chronic plaque psoriasis. Br J Dermatol 2005; 153:613–619.

21 Abels DJ, Rose T, Bearman JE. Treatment of psoriasis at a Dead Sea dermatology clinic. Int J Dermatol 1995; 34:134 – 137.

22 Tiplica GS, Salavastru CM. Mometasone furoate 0.1% and salicylic acid 5% vs. mometasone furoate 0.1% as sequential local therapy in psoriasis vulgaris. J Eur Acad Dermatol Venereol 2009; 23:905–912.

23 Keller JJ, Lin HC. The effects of chronic periodonitis and its treatment on the subsequent risk of psoriasis. Br J Dermatol 2012; 167:1338–1344.

24 Jenna H, Hildur S, Helga K, Jona F. effect of balneophototherapy in Blue Lagoon. J Dermatol Sci 2017; 96:2.

25 Ali FM, Cueva AC, Vyas J, Atwan AA, Salek MS. A systematic review of the use of quality-of-life instruments in randomized controlled trials for psoriasis. Br J Dermatol 2017; 176:577–593.

26 Kopel E, Levi A, Harari M, Ruzicka T, Ingber A. Effect of Dead Sea climatotherapy for psoriasis on quality of life. Isr Med Assoc J 2013; 15:99–102.