ORIGINAL ARTICLE

Patients' satisfaction, unmet needs, and treatment benefits in moderate to severe psoriasis in Greece: results from a cross-sectional survey

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ABSTRACT

BACKGROUND: Data regarding patients' satisfaction, individuals' therapeutic needs and their perception regarding the treatment benefit might provide useful insights for the unmet medical need from patients' perspective. To the best of our knowledge, no data are available in Greece investigating in depth moderate to severe psoriasis while there is a scarcity of studies in the international literature. The objective of this study was to capture patients' satisfaction and perception about treatment benefits in patients with moderate to severe psoriasis in Greece.
METHODS: A cross-sectional survey was conducted in March-April 2021. Eligible to participate were adults with moderate to severe psoriasis, members of the Greek patient association EPIDERMIA. A structured questionnaire including socio-demographic factors, history of disease, comorbidities, current treatment, severity self-assessment and impact in daily activities, treatment adherence, treatment satisfaction, and Patient Benefit Index (PBI), was developed. Univariate parametric and non-parametric tests along with generalized linear models were applied.
RESULTS: A total of 314 adults with moderate to severe psoriasis responded. The 97.5% of the participants reported that they were under treatment, while 41.1% of them mentioned none or little/quite satisfaction by their current treatment, with the most frequently reported reason of dissatisfaction to be the "no satisfactory improvement since treatment onset." The most important therapeutic goals from patient perspective were to "be healed of all skin defects," and to "get better skin quickly." The therapeutic benefit for these goals was found to be moderate (55% and 67%, respectively). Multivariate analysis confirmed that treatment type and psoriasis severity were factors independently associated with treatment satisfaction, and PBI Score.
CONCLUSIONS: The results of this survey reveal the unmet medical need for moderate to severe psoriasis from patient perspective, since 2/5 patients stated that they are not much or very much satisfied with their current treatment, and more than half patients stated that the most important therapeutic goals (*i.e.*, clean skin, early onset) for them are not achieved.

(*Cite this article as*: Stefanou G, Kourlaba G, Vamvakousis E, Koukopoulou S, Yfantopoulos J. Patients' satisfaction, unmet needs, and treatment benefits in moderate to severe psoriasis in Greece: results from a cross-sectional survey. Ital J Dermatol Venereol 2022;157:424-31. DOI: 10.23736/S2784-8671.22.07258-9)

KEY WORDS: Surveys and questionnaires; Psoriasis; Patient satisfaction.

Psoriasis is a common, chronic immune disease with an estimated global prevalence of 2% (120 million patients).[1] The most common expression of the disease is through well-defined, erythematous plaques (scales) which can be painful or cause itching, resulting in significant physical and psychosocial impact on patients' quality of life.[2, 3] Chronic systemic inflammation caused by psoriasis, as well as the immune nature of the disease contribute to high rates of comorbidity in these patients.[4-6] The physical symptoms (pain and itching) and the stigma related to skin deformity, causes patients to experience reduced self-esteem, social isolation and reduced quality of life.[7, 8] Patients with psoriasis seem to experience difficulties at work, in social interactions with family and friends, physical function, sexual activity and moving around comfortably in public. In addition, patients themselves are concerned that

their disease would worsen, are anxious about their appearance and feeling unattractive and are distressed.[9] Over the past decades, the treatment of moderate to severe psoriasis has been evolved rapidly due to our better understanding of psoriasis pathogenesis, as in other immune diseases. Among the available treatment options are the conventional systemic treatments (acitretin, ciclosporin, fumaric acid esters, methotrexate), which are recommended as first treatment options for the management of moderate to severe psoriasis by the European Dermatology Forum (EDF) and the Greek therapeutic protocol of psoriasis (Ministry of Health).[10, 11] In case of inadequate response, contraindication or intolerance, the available treatments options are the phosphodiesterase (PDE) 4 inhibitor (apremilast), a recently indicated small molecule, and the highly specific biologic agents, as tumor necrosis factor (TNF) α inhibitors, interleukin (IL) -17, IL-12/23, and IL-23 inhibitors, which were recently developed and indicated in psoriasis. Especially, some of the biologic agents (adalimumab, certolizumab, brodalumab, ixekizumab, secukinumab, guselkumab, risankizumab, tildrakizumab) could be administered as first option in patients with severe disease.[10] In the following years, new agents are expected to be approved and hopefully alter the burden of psoriasis. Biologic agents hold high promises in terms of efficacy, drug survival, and safety, with IL-17 and IL-23 to improve patients' symptoms and to show sustained skin clearance.[12, 13] However, Florek *et al.* in a systematic literature review (SLR) conducted in 2017, reported that patient satisfaction with existing therapies remains modest; among those, the biologic agents achieve higher treatment satisfaction compared to oral therapy, phototherapy, and topical therapy.[14] Data regarding patients' satisfaction can play a crucial role in the assessment of new therapies for reimbursement, since might provide useful insights for the unmet medical need from patients' perspective.[15] Since the approval of ILs-17, limited data are available regarding treatment satisfaction of patients with moderate to severe disease in international literature, while no data are available in Greece.[14, 16] Moreover, another valuable patient reported outcome that provide useful insights regarding the unmet medical need from patient perspective, is individuals' therapeutic needs and their perception regarding the treatment benefit for each one of their needs. A valid and reliable instrument on individual needs and treatment benefits is the Patient Benefit Index (PBI).[17-20] The German and Swiss psoriasis registries chose PBI for characterizing patient needs for treatment and confirmed that complete skin clearance and quick skin recovery are the most important goals of psoriatic patients.[20] Since today, no PBI

data are available in Greece. Hence, the primary objective of this study was to capture the patients' satisfaction and perception about treatment benefits in moderate to severe psoriasis in Greece.

Materials and methods

For this report, we used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Guidelines.[21]

Study design and participants

A cross-sectional survey with a structured questionnaire was conducted, between March 12, 2021, and April 19, 2021. Eligible to participate were adults (age≥18 years) with moderate to severe psoriasis, members of the Greek patient association EPIDERMIA. The questionnaire was sent as a link via an email to the members with an available email address; while the rest members were conducted via phone and data were collected through a telephone interview. The recruitment process was performed by EPIDERMIA staff, without recording members' personal data. All participants were informed a priori for the purposes of the study, and they were asked to provide their consensus for study participation. The participation in the survey was voluntary. Participants were able to withdraw their consensus at any time. Collected data were anonymous and confidential.

Data collection

Prior to the development of the questionnaire, a targeted literature review was performed to identify appropriate disease-specific (if available) self-reported tools that capture the patients' treatment satisfaction, treatment adherence, treatment needs and benefits and disease severity. The questionnaire was developed in the Greek language, and it was consisted of the following factors: socio-economic factors and history of disease: sex, age, education level, occupational status, diagnosis age, psoriasis type, specialty of the doctor who made the diagnosis, time from symptoms' onset to diagnosis, evaluation of the disease at the last available diagnosis as made by the clinician, patient information source for psoriasis; comorbidities: presence or absence of a history of other diseases, as cardiovascular disease, diabetes, depression, anxiety disorder, psoriatic arthritis, and inflammatory bowel disease; current treatment received, as topical, phototherapy, conventional systemic treatment, biological agents and PDE4 inhibitors, and treatment duration (for the last two categories); self-assessment of disease severity and impact in daily activities: with the

use of the self-assessment Simplified Psoriasis Index-severity (saSPI-s) and Simplified Psoriasis Index-psychosocial components (saSPI-p);[22] treatment adherence: adherence frequency (I follow my treatment regularly; there are few times I forget to take my treatment; sometimes I forget to take my treatment; many times, I forget to take my treatment, I never take my treatment) and reasons of non-adherence; treatment satisfaction: degree of satisfaction, and reasons of dissatisfaction; Patient Benefit Index (PBI) to capture patient preferences.

Outcome variables

The treatment satisfaction was collected with a 5-scale Likert study-specific question which indicated the degree of participants' satisfaction with their current treatment (not at all/little/quite/a lot/very much satisfied). Reasons of treatment dissatisfaction were collected as well (due to side effects; I had to change my lifestyle; no satisfactory improvement; delayed satisfactory improvement; worried about long-term safety; other). The PBI is a validated goal attainment scaling tool in the treatment of psoriasis, which capture patient preferences in treatment goals and benefits and it is consisting of the Patient Needs Questionnaire (PNQ) and the Patient Benefits Questionnaire (PBQ); from the weighted goals of BNQ and the achieved benefits of PBQ, a single global score is calculated with values from 0 to 4 where higher values to indicate higher benefits adjusted for needs.[23] For the interpretation of goals and benefits in psoriasis treatment, the 23 PBI items have been assigned to five subscales, with range 0 to 4 (higher values indicate higher benefits), named as: reducing psychological impairments (less depressed; joy of living; lead a normal everyday life; engage in normal leisure activities), reducing social impairments (less of a burden to relatives/friends; normal working life; more contact with others; dare to show oneself more; less burdened in partnership; normal sex life), reducing impairments due to therapy (less dependent on doctor/clinic visits; spend less time with daily care; fewer out-of-pocket treatment expenses; fewer side effects), reducing physical impairments (free of pain, itching, burning sensation on the skin; healed of all skin alterations; sleep better), and building confidence into therapy (no fear of disease progression; clear diagnosis and therapy; confidence in therapy).[24]

Statistical analysis

This was an exploratory in nature study, and it was not required to consider predetermined assumptions about the statistical significance and/or the direction of correlations. Descriptive statistics were used to evaluate the socio-economic factors, comorbidities, medical history, current treatment, self-reported severity of disease, treatment adherence, treatment satisfaction, and patients' needs and treatment benefits. Continuous parameters were summarized by providing the number of observations, means and standard deviations (SD) or quartiles (1st: Q1, 2nd: Q2 – median, and 3rd: Q3), as appropriate. Categorical parameters were summarized by absolute and relative frequencies (N., %). The association between two categorical parameters was performed with Pearson's χ^2 test while, the differences of a continuous parameter across the groups of a categorical parameter were examined with the appropriate non-parametric test (Mann-Whitney U or Kruskal Wallis Test), as the continuous parameters of interest did not follow the normal distribution. For treatment satisfaction, and treatment goals and benefits, appropriate univariate generalized linear models (GLM) were applied to identify factors associated with them among demographic characteristics, disease and clinical characteristics, treatment information and treatment adherence. More specifically, the treatment satisfaction was assessed with a logistic regression model, while treatment needs and benefits with a GLM with log link function under the gaussian distribution. Variables with a P value <0.15 in the univariate level were included in the multivariate model; then the inclusion of other variables in the multivariate model was considered and the model with the best fit, based on AIC criterion, was chosen. The fit of the best model was then evaluated with the Homer-Lemeshow goodness-of test in the case of logistic regression. All tests were two-sided and carried out with a 5% α-error rate without correction for multiplicity. Data cleaning, data manipulation and data analysis were conducted using the statistical software Stata (version 14.2, 2017; StataCorp LLC, College Station, TX, USA).

Results

Participants' profile

At the initiation of data collection, EPIDERMIA members were 573. Among them, 380 members agreed to participate in the study, with 314 suffering from moderate to severe psoriasis (Supplementary Digital Material 1: Supplementary Figure 1). The median (Q1-Q3) age of the eligible responders was 54 (44-63) years and 54.8% of them were female. Almost half of them (49%) had received upper secondary education and 39.8% had a bachelor's or

higher degree. Regarding their occupational status, 58% of the responders were either employed or self-employed, while 24.8% of them were unemployed. The most frequently reported sources of information about psoriasis were doctors (94.5%), patient associations (79.1%) and internet (36.3%). Plaque psoriasis was the most frequent reported type (95.2%), while the 46.8% of the responders had at least one comorbidity, with psoriatic arthritis to be the most frequent one (53.1%), followed by cardiovascular disease (19.3%) and diabetes (14.5%). The median (Q1-Q3) time from symptoms' onset to diagnosis was 6 (1-12) months, while most of responders were diagnosed after the age of 40 years (81.5%). Psoriasis diagnosis was mostly performed by dermatologists (90.8%), followed by rheumatologists (6.7%). The self-reported severity based on SaSPI-s Score was moderate-severe for 48.7% of the participants. Based on the saSPI-p Score, the impact of psoriasis on daily activities was from "quite a lot" to "very much" for 88.8% of the participants. The 97.5% of responders was under treatment during data collection. Most of them were under topical treatment (79.7%) with or without another treatment; almost half of the participants under treatment were under a biologic agent or PDE4 inhibitor (49.7%). As for biologic agents, the TNF-a inhibitors (20.6%), interleukin-17 inhibitors (10.1%) and interleukin-12/-23 inhibitors (9.8%) were the most common. The median (Q1 – Q3) treatment duration for biologic agents was 24 (12-28.5) months (Supplementary Digital Material 2: Supplementary Table I). Almost 44.9% of the responders followed their current treatment regularly. Among the rest, the most common reasons of non-adherence were the frequent drug doses (57.9%) and the fear of COVID-19 (19.5%). Those treated with an IL-17 or -12/23 inhibitor ± phototherapy/conventional systemic/topical treatment were more likely to follow their treatment schedule regularly (83.9%; 70%; respectively) compared to compared to rest types of treatment which ranged from 26.8% to 49.2% (P<0.001) (Supplementary Digital Material 3: Supplementary Table II).

Patients' satisfaction with treatment and perception about treatment benefits

In total, 41.1% were "not at all," "little" or "quite" satisfied by their current treatment, with the most common reported reason of dissatisfaction to be the "no satisfactory improvement since the onset of treatment" (64.3%). The median (Q1-Q3) of PBI global score was 2.9 (2.4-3.3) in a range of 0 (no benefit) to 4 (maximal benefit). Among the 5 subscales of the PBI, the subscale of "reducing impairments due to therapy" had the lowest score

TABLE I.—*Treatment satisfaction and patient needs and benefits of participants under treatment.*

Treatment satisfaction, N. (%)	Total N.=306
Not at all	9 (2.9%)
Little	33 (10.8%)
Quite	79 (25.8%)
A lot	145 (47.4%)
Very much	40 (13.1%)
Reasons of dissatisfaction, v (%)	N.=121
Due to side effects	16 (13.2%)
I had to change my lifestyle	1 (0.8%)
No satisfactory improvement	83 (68.6%)
Delayed satisfactory improvement	14 (11.6%)
Worried about long-term safety	16 (13.2%)
Other	1 (0.8%)
Not applied to me	8 (6.6%)
Patient needs and benefits	N.=301
Global score PBI, median (Q1-Q3)	2.9 (2.4-3.3)
PBI Subscales, median (Q1-Q3)	
Reducing social impairments (N.=277)	3.3 (2.6-3.7)
Reducing psychological impairments (N.=269)	3.5 (2.8-4.0)
Reducing impairments due to therapy (N.=289)	1.8 (1.0-2.5)
Reducing physical impairments (N.=299)	2.8 (2.2-3.2)
Having confidence in healing (N.=287)	3.7 (3.0-4.0)

Q1: 1st quartile; Q3: 3rd quartile; PBI: Patient Benefit Index.

(median [Q1-Q3]: 1.8 [1.0-2.5]), indicating that for these goals which are associated with therapy (*i.e.*, as less doctor visits, less time spend with daily care, lower out-of-pocket treatment costs and fewer side effects) the participants reported a small benefit (Table I). Considering the PNQ items, the items that were reported as quite or very important (high agreement) from at least 95% of the responders were the "be healed of all skin defects," "get better skin quickly" and "be free of itching," while the item reported less frequently as quite/very important was the "be able to lead a normal working life" (56%). Based on the answers of participants in PBQ, it was found that only 55%, 67% and 47%, of the responders were quite or very helped by their current treatment for the following important therapeutic goals: "be healed of all skin defects," "get better skin quickly" and "be free of itching," respectively (Figure 1).

The impact of current treatment on patients' satisfaction, perception regarding treatment benefits

The association of treatment satisfaction, and patient therapeutic needs and benefits with the type of treatment is presented in Table II. Treatment type was categorized as follows: TNF-a, IL-17, IL-12/23, and PDE4 inhibitors with or without phototherapy/conventional systemic/topical treatment, phototherapy/conventional systemic treatment with or without topical treatment and only topi-
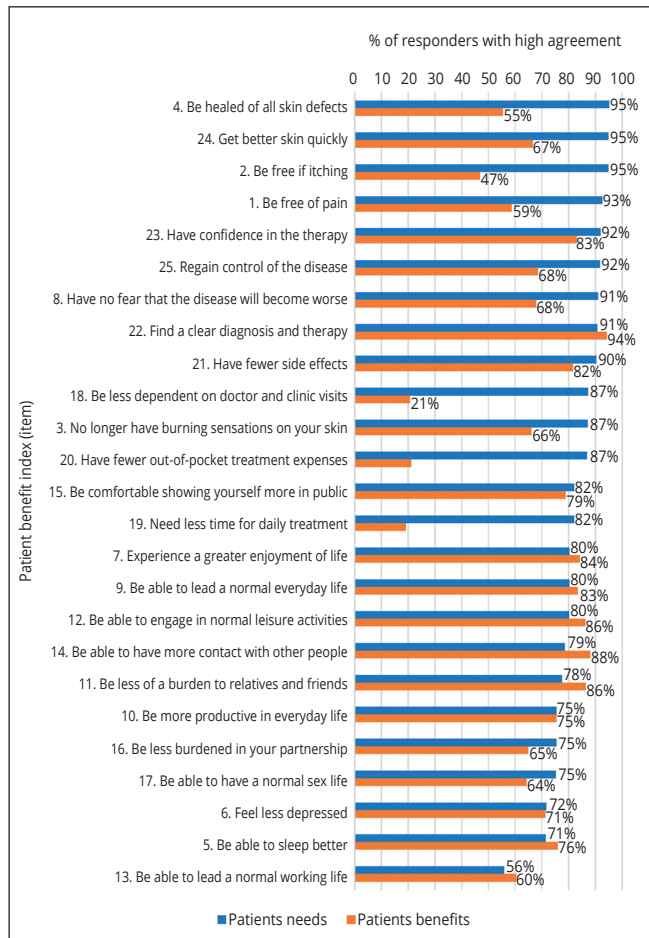
Figure 1.—Percentage (%) of responders with high agreement in the items of Patients Needs and Benefits Questionnaires.

inhibitors with or without phototherapy/ conventional systemic/ topical treatment, respectively, were satisfied with their current treatment, while treatment satisfaction ranged from 48.7% to 63.2% for the rest of the treatment options (P=0.001). Additionally, the median (Q1 – Q3) PBI Score was higher in those treated with PDE4 or IL-17 inhibitors ± phototherapy/ conventional systemic/ topical treatment compared to those treated with TNF-a inhibitors ± phototherapy/ conventional systemic/ topical treatment, phototherapy/ conventional systemic ± topical treatment, or only topical treatment (P=0.019). No significant difference was detected among the treatment options on the percentage of patients reported that they were quite or very helped by their current treatment for the PBI items "helped to be healed of all skin defects" and "helped to be free of itching." On the other hand, it was found that treatment was associated with the item "helped to get better skin quickly," where 90% and 84% of participants treated with IL-17 or PDE4 inhibitors, respectively, ±phototherapy/conventional systemic/topical treatment were quite or very helped by their current treatment, while the rest of the treatments ranged from 55.7% to 67.2% (P=0.011) (Supplementary Digital Material 4: Supplementary Figure 2).

Multivariate analysis

In Table III, the results of univariate and multivariate models are presented. In the univariate analysis models, the psoriatic arthritis (PsA) (yes *vs*. no), the current treatment, and the severity based on SaSPI-s Score were identified as factors significantly associated with treatment satisfaction. Multivariate analysis confirmed that treatment type and severity of psoriasis were factors that are independently associated with treatment satisfaction: responders treated with IL-17 or PDE4 inhibitors ± phototherapy/

cal treatment. Treatment satisfaction was statistically significantly associated with current treatment. More specifically, 87.1% and 84% of those treated with IL-17 or PDE 4

TABLE II.—*Satisfaction, adherence, patient needs and benefits and quality of life by ongoing pharmacological treatment.*

	Anti-TNF-a ± phototherapy/ conventional systemic/topical treatment	Anti-IL 17 ± phototherapy/ conventional systemic/ topical treatment	Anti-IL 12/23 ±phototherapy/ conventional systemic/topical treatment	PDE4 inhibitor ± phototherapy/ conventional systemic/ topical treatment	Phototherapy/ conventional systemic ± topical treatment	Only topical treatment	P value
Current treatment	N.=63	N.=31	N.=30	N.=25	N.=68	N.=74	
Satisfaction, N. (%)							
Not at all/little/quite	28 (44.4%)	4 (12.9%)	14 (46.7%)	4 (16%)	25 (36.8%)	38 (51.3%)	
A lot/very much	35 (55.6%)	27 (87.1%)	16 (53.3%)	21 (84%)	43 (63.2%)	36 (48.7%)	0.001**
PBI Score	N.=62		N.=29			N.=72	
Median (Q1-Q3)	2.8 (2.2-3.2)	3.1 (2.7-3.5)‡/‡‡/‡‡‡	2.9 (2.6-3.4)	3.1 (2.7-3.4)‡/‡‡/‡‡‡	2.9 (2.4-3.1)	2.8 (2.0-3.2)	0.019*

Q1: 1ˢᵗ quartile; Q3: 3ʳᵈ quartile; PBI: Patient Benefit Index; QoL: Quality of life; IL: interleukin; PDE: phosphodiesterase.
*Kruskal Wallis equality-of-populations rank test (with ties); **Pearson's χ2 test; ‡Score differs compared to only topical treatment (P<0.05; Dunn's Pairwise Comparison); ‡‡score differs compared to TNF-a inhibitors ± phototherapy/ conventional systemic/topical treatment (P<0.05; Dunn's Pairwise Comparison); ‡‡‡score differs compared to phototherapy/conventional systemic ± topical treatment (P<0.05; Dunn's Pairwise Comparison).

TABLE III.—*Multivariate analysis results of treatment satisfaction, adherence, and PBI with important factors.*

	Treatment satisfaction# [N.=291]				Patient Benefit Index ** [N.=286]			
	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value	Crude Exp(b) (95% CI)	P value	Adjusted Exp(b) (95% CI)	P value
Sex (male *vs.* female)	0.82 (0.52, 1.29)	0.399			1.00 (0.94, 1.06)	0.880		
Age, decades	0.87 (0.74, 1.03)	0.118	0.95 (0.77, 1.46)	0.592	1.01 (0.99, 1.03)	0.454		
PsA (yes *vs.* no)	2.23 (1.27, 3.92)	0.005*	1.87 (0.95, 3.67)	0.071	0.99 (0.92, 1.06)	0.739		
Time since diagnosis, years	1.00 (0.98, 1.02)	0.991			1.00 (1.00, 1.00)	0.542		
Current treatment		<0.001‡*		0.016‡*		0.003‡*		0.049‡*
Only topical treatment	Ref		Ref		Ref			
Phototherapy/conventional systemic ± topical	1.82 (0.93, 3.55)	0.082	1.40 (0.68, 2.92)	0.363	1.08 (0.99, 1.17)	0.103	1.05 (0.97, 1.15)	0.202
Anti-TNFs ± phototherapy/ conventional systemic/ topical	1.32 (0.67, 2.59)	0.420	1.08 (0.50, 2.34)	0.849	1.04 (0.95, 1.14)	0.396	1.06 (0.96, 1.15)	0.252
Anti-IL 17 ± phototherapy/ conventional systemic/ topical	7.13 (2.27, 22.4)	0.001	5.92 (1.74, 20.2)	0.005*	1.20 (1.08, 1.33)	0.001	1.14 (1.04, 1.27)	0.007*
Anti-IL 12/23 ± phototherapy/ conventional systemic/ topical	1.21 (0.52, 2.82)	0.665	1.13 (0.45, 2.78)	0.798	1.12 (1.00, 1.25)	0.041	1.12 (1.01, 1.24)	0.038*
PDE4 inhibitor ± phototherapy/ conventional systemic/ topical	5.54 (1.73, 17.7)	0.004	4.62 (1.39, 15.4)	0.013*	1.18 (1.06, 1.32)	0.003	1.15 (1.03, 1.27)	0.013*
Psoriasis severity (saSPI-s)		<0.001‡*		<0.001‡*		<0.001‡*		<0.001‡*
Mild	Ref		Ref		Ref		Ref	
Moderate	1.61 (0.99, 2.61)	0.054	1.56 (0.91, 2.69)	0.109	0.95 (0.90, 1.01)	0.075	0.95 (0.90, 1.01)	0.082
Severe	0.20 (0.07, 0.55)	0.002	0.16 (0.05, 0.48)	0.001*	0.70 (0.61, 0.81)	<0.001	0.70 (0.61, 0.80)	<0.001*
Adherence [noa *vs.* yesb]	0.90 (0.56, 1.43)	0.642			0.95 (0.90, 1.01)	0.0105	0.94 (0.89, 1.00)	0.054

After the inclusion of variables with P<0.15 in the model, the addition of treatment variable was considered and is presented here as a better fit was identified based on AIC criterion (model with treatment variable: AIC=332.6; model without treatment variable: AIC=365.4).
Ref: reference category; CI: confidence interval; Exp: exponential; IL: interleukin; PDE: phosphodiesterase.
#Logistic regression: the dependent variable of satisfaction was categorized as 0: "not at all/little/quite satisfied" and 1: "a lot/very much satisfied;" **a generalized linear model was performed with log link function and probability distribution of normal family; ‡Wald Test for overall test of categorical variable. ‡‡satisfaction and PBI Score were correlated, but due to their association with type of treatment, they were not included in these multivariate models; aI forget to take my treatment (few/some/may times /always); bI follow my treatment regularly; *statistically significant.

conventional systemic/topical treatment were expected to have ~6 and ~5 times, respectively, increased odds to be "a lot/very much" satisfied, compared to those treated with only topical treatment (P=0.005, P=0.013; respectively), while participants with severe psoriasis were expected to have 84% lower odds to be "a lot/very much" satisfied, compared to those with mild disease. As factors that are independently associated with PBI global score, the current treatment, severity, and adherence were identified. Multivariate analysis confirmed treatment and disease severity as factors independently associated with PBI global score. Participants with severe disease were expected to have 30% lower achieved benefits compared to those with mild severity, while those treated with IL-17, IL 12/23 and PDE4 inhibitors ± phototherapy/conventional systemic/topical treatment were expected to have 14%, 12% and 15%, respectively, higher achieved benefits, compared to those under only topical treatment.

Discussion

The primary objective of the present study to capture the patients' satisfaction and perception about treatment bene-

fits in moderate to severe psoriasis in Greece. To the best of our knowledge, limited data are available regarding treatment satisfaction, and perception about treatment benefits in the international literature, while no data are available for Greece. Based on our findings, the 40% of the responders were not satisfied at all, little or quite satisfied with their current treatment, with the main reason of dissatisfaction to be the "non-satisfactory improvement." Treatment satisfaction was associated with the type of treatment: the highest levels of satisfaction were observed in responders treated with PDE4 (84%) and IL-17 (87%) inhibitors, while the rest of the responders had moderate levels of satisfaction (49-63%). Our results are aligned with those of a cross-sectional study conducted in U.S., where 52% of patients with psoriasis were dissatisfied with their treatment, and those of a German study reported that 55% of patients were "rather/very dissatisfied."[25, 26] In a national Canadian survey conducted in 2016, the treatment satisfaction with biologic and nonbiologic drugs was compared. The authors concluded that the PD4 inhibitor had the highest satisfaction proportion among nonbiologic drugs, a result aligned with our findings, and ustekinumab (IL-12/23 inhibitor) and adalimumab (TNF-a inhibitor) among biologic drugs;

only the IL-17 inhibitor secukinumab was available in the time of this study, and only 5.5% of users were under treatment with secukinumab, a fact that explains the different findings with our study. Those researchers evaluated treatment satisfaction based on multiple criteria (overall satisfaction, skin clearance, long-term efficacy, rapid effect, low risk of side effects, type of administration, etc.).[27] In an internet-based survey conducted in U.S. during 2016, authors reported that the investigated PDE4 inhibitor had similar satisfaction with biologics due to convenience, ease of taking treatment and administration comfort.[28] In our study, the satisfaction was a general term, and not specific criteria were considered. Multivariate analysis in our study confirmed that PDE4 and IL-17 inhibitors were associated with better satisfaction. Our results are aligned with those of the web-based survey study of van Cranenburgh *et al.*, where patients treated with a biologic agent, systemic treatment or phototherapy were more satisfied with their treatment compared to those under topical treatment.[29] PDE4 inhibitors were not a management option of psoriasis till early 2015, when apremilast was approved, and it was not investigated in that study. The most important reported patient anticipated needs were to "be healed of all skin defects," and to "get better skin quickly," while the least important was to "be able to lead a normal working life." These results are aligned with those reported in the study of Maul *et al.* with participants from German and Swiss psoriasis registries.[20] In our study, multivariate analysis confirmed the association of treatment type with global score PBI, a higher score was identified in those under interleukin -17 or 12/23 or PDE4 inhibitors ± phototherapy/ conventional systemic/ topical treatment compared to those under only topical treatment. These results are aligned with those of a cross-sectional study in Germany.[30]

Limitations of the study

Our explorative, cross-sectional study was limited by the absence of a control group, while the relatively small sample size for medications limits the generalizability of our findings. Other limitations were the unknown number of urban-living respondents, restricting generalizability in the population of moderate-severe psoriasis in Greece. Additionally, our study comprised a highly selected population of patients treated either with biologics or PDE4 inhibitors, which may differ from patients treated with conventional systemics and the PNQ questionnaire (1st part of PBI) was collected retrospectively, introducing the chance of recall bias. Moreover, we included only members of a patient association, possibly resulting in a selection of patients with a

strong opinion about the quality of healthcare and of more chronically ill patients. Finally, we used a study-specific satisfaction and adherence questionnaire, consisting of one item each and constructed for the purposes of this study, setting limits to the reliability, and we assumed that satisfaction and adherence with current treatment would be determined by the main treatment, whereas an additional treatment may also affect these outcomes. Other criteria that could explain treatment satisfaction were not collected. However, a systematic review by Bronsard *et al* attempted to examine the accuracy and reliability of patients' preferences about treatment tools, eventually concluding that there are no "ideal" tools at present[31] and despite their limitations, it is important to note that the contribution of these tools is invaluable as they provide an insight into the disease burden from the patients' perspective, which is essential in making patient management decisions.[32] Additionally, the study purpose was not to provide evidence-based guidelines, rather the information presented is primarily to understand the patients' perceptions in moderate to severe psoriasis in Greece. Strengths of the study include the use of widely established measures, *i.e.*, PBI and the high number of response rate.

Conclusions

In conclusion, the results of this survey reveal the unmet medical need for moderate to severe psoriasis from the perspective of patients, since 2 out of 5 patients stated that they are not much or very much satisfied with their current treatment and more than half patients stated that the most important therapeutic goals for them (*i.e.*, clean skin, early onset etc.) are not achieved.

References

1. Michalek IM, Loring B, John SM. A systematic review of worldwide epidemiology of psoriasis. J Eur Acad Dermatol Venereol 2017;31:205–12.

2. Koo J, Marangell LB, Nakamura M, Armstrong A, Jeon C, Bhutani T, *et al.* Depression and suicidality in psoriasis: review of the literature including the cytokine theory of depression. J Eur Acad Dermatol Venereol 2017;31:1999–2009.

3. Hayes J, Koo J. Psoriasis: depression, anxiety, smoking, and drinking habits. Dermatol Ther 2010;23:174–80.

4. Späh F. Inflammation in atherosclerosis and psoriasis: common pathogenic mechanisms and the potential for an integrated treatment approach. Br J Dermatol 2008;159(Suppl 2):10–7.

5. Davidovici BB, Sattar N, Prinz J, Puig L, Emery P, Barker JN, *et al.* Psoriasis and systemic inflammatory diseases: potential mechanistic links between skin disease and co-morbid conditions. J Invest Dermatol 2010;130:1785–96.

6. Boehncke WH, Boehncke S, Tobin AM, Kirby B. The 'psoriatic march': a concept of how severe psoriasis may drive cardiovascular comorbidity. Exp Dermatol 2011;20:303–7.

7. Weiss SC, Kimball AB, Liewehr DJ, Blauvelt A, Turner ML, Emanuel EJ. Quantifying the harmful effect of psoriasis on health-related quality of life. J Am Acad Dermatol 2002;47:512–8.

8. Kouris A, Christodoulou C, Stefanaki C, Livaditis M, Tsatovidou R, Kouskoukis C, et al. Quality of life and psychosocial aspects in Greek patients with psoriasis: a cross-sectional study. An Bras Dermatol 2015;90:841–5.

9. Krueger G, Koo J, Lebwohl M, Menter A, Stern RS, Rolstad T. The impact of psoriasis on quality of life: results of a 1998 National Psoriasis Foundation patient-membership survey. Arch Dermatol 2001;137:280–4.

10. Nast A, Smith C, Spuls PI, Avila Valle G, Bata-Csörgö Z, Boonen H, et al. EuroGuiDerm Guideline on the systemic treatment of Psoriasis vulgaris - Part 1: treatment and monitoring recommendations. J Eur Acad Dermatol Venereol 2020;34:2461–98.

11. Scientific Board of Psoriasis. Psoriasis Diagnostic and Therapeutic Protocols. Ministry of Health, Greece; 2018 [Internet]. Available from: https://www.moh.gov.gr/articles/health/domes-kai-draseis-gia-thn-ygeia/kwdikopoihseis/therapeytika-prwtokolla-syntagografhshs/diagnwstika-kai-therapeytika-prwtokolla-syntagografhshs/5235-diagnwstika-kai-therapeytika-prwtokolla-pswriashs [cited 2022, May 4].

12. Dong J, Goldenberg G. New biologics in psoriasis: an update on IL-23 and IL-17 inhibitors. Cutis 2017;99:123–7.

13. Lee EB, Amin M, Bhutani T, Wu JJ. Emerging therapies in psoriasis: a systematic review. Cutis 2018;101:5–9.

14. Florek AG, Wang CJ, Armstrong AW. Treatment preferences and treatment satisfaction among psoriasis patients: a systematic review. Arch Dermatol Res 2018;310:271–319.

15. Feldman SR, Regnier SA, Chirilov A, Hey F, Gilloteau I, Cella D. Patient-reported outcomes are important elements of psoriasis treatment decision making: A discrete choice experiment survey of dermatologists in the United States. J Am Acad Dermatol 2019;80:1650–7.

16. Belinchón I, Rivera R, Blanch C, Comellas M, Lizán L. Adherence, satisfaction and preferences for treatment in patients with psoriasis in the European Union: a systematic review of the literature. Patient Prefer Adherence 2016;10:2357–67.

17. Augustin M, Radtke MA, Zschocke I, Blome C, Behechtnejad J, Schäfer I, et al. The patient benefit index: a novel approach in patient-defined outcomes measurement for skin diseases. Arch Dermatol Res 2009;301:561–71.

18. da Silva N, von Stülpnagel C, Langenbruch A, Danckworth A, Augustin M, Sommer R. Disease burden and patient needs and benefits in anogenital psoriasis: developmental specificities for person-centred healthcare of emerging adults and adults. J Eur Acad Dermatol Venereol 2020;34:1010–8.

19. Krenzer S, Radtke M, Schmitt-Rau K, Augustin M. Characterization of patient-reported outcomes in moderate to severe psoriasis. Dermatology 2011;223:80–6.

20. Maul JT, Navarini AA, Sommer R, Anzengruber F, Sorbe C, Mrowietz U, et al. Gender and age significantly determine patient needs and treatment goals in psoriasis - a lesson for practice. J Eur Acad Dermatol Venereol 2019;33:700–8.

21. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol 2008;61:344–9.

22. Chularojanamontri L, Griffiths CE, Chalmers RJ. Responsiveness to change and interpretability of the simplified psoriasis index. J Invest Dermatol 2014;134:351–8.

23. Feuerhahn J, Blome C, Radtke M, Augustin M. Validation of the patient benefit index for the assessment of patient-relevant benefit in the treatment of psoriasis. Arch Dermatol Res 2012;304:433–41.

24. Blome C, Augustin M, Behechtnejad J, Rustenbach SJ. Dimensions of patient needs in dermatology: subscales of the patient benefit index. Arch Dermatol Res 2011;303:11–7.

25. Armstrong AW, Robertson AD, Wu J, Schupp C, Lebwohl MG. Undertreatment, treatment trends, and treatment dissatisfaction among patients with psoriasis and psoriatic arthritis in the United States: findings from the National Psoriasis Foundation surveys, 2003-2011. JAMA Dermatol 2013;149:1180–5.

26. Franzke N, Montenbruck M, Langenbruch AK, Beikert FC, Kresken J, Augustin M. Drug supply for psoriasis - results from a national pharmacy network. J Dtsch Dermatol Ges 2013;11:638–43.

27. Ighani A, Yu AM, Sandhu VK, Barankin B, Manolson MF. Satisfaction and Awareness of Systemic Psoriasis Treatments: A National Survey Comparing Biologic and Nonbiologic Users. J Cutan Med Surg 2019;23:148–56.

28. Lee LK, Mehta S, Ung B. Patient-reported treatment adherence and satisfaction among psoriasis patients receiving treatment with apremilast or biologics. J Am Acad Dermatol 2019;81:101.

29. van Cranenburgh OD, de Korte J, Sprangers MA, de Rie MA, Smets EM. Satisfaction with treatment among patients with psoriasis: a web-based survey study. Br J Dermatol 2013;169:398–405.

30. Zander N, Naatz M, Augustin M, Langenbruch A, Topp J, Mrowietz U, et al. Determinants of costs and benefits in psoriasis routine care: results from a cross-sectional nationwide study in Germany. J Eur Acad Dermatol Venereol 2021;35:e63–5.

31. Bronsard V, Paul C, Prey S, Puzenat E, Gourraud PA, Aractingi S, et al. What are the best outcome measures for assessing quality of life in plaque type psoriasis? A systematic review of the literature. J Eur Acad Dermatol Venereol 2010;24:17–22.

32. Frieder J, Kivelevitch D, Fiore CT, Saad S, Menter A. The impact of biologic agents on health-related quality of life outcomes in patients with psoriasis. Expert Rev Clin Immunol 2018;14:1–19.