



Dermatology Reports

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eISSN 2036-7406



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Chirurgica, Oncologica, Correttiva ed Estetica

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E-publishing of this PDF file has been approved by the authors.

Please cite this article as:

Milidrag A, Zlatanović M, Miličić V, et al. Domain-specific Skindex-29 response under biologics, conventional systemics, and phototherapy: a four-time-point real-world brief report. *Dermatol Rep* 2026 [Epub Ahead of Print] doi: 10.4081/dr.2026.10651

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Received: 16 October 2025; Accepted: 30 July 2026.

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Domain-specific Skindex-29 response under biologics, conventional systemics, and phototherapy: a four-time-point real-world brief report

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Key words: psoriasis; Skindex-29; quality of life; biologics; phototherapy.

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Conflict of interest: the authors have no conflict of interest to declare.

Ethics approval and consent to participate: the study was conducted in accordance with the Declaration of Helsinki and it was approved by the Ethics Committee of the University Clinical Center Kragujevac, Serbia (No. 01.21-375; 28 Oct 2021). All participants provided written informed consent prior to enrollment.

Availability of data and materials: the datasets analyzed during the current study are available from the corresponding author on reasonable request.

Funding: this study was funded by Junior Research Project JP08/22, “The impact of phototherapy on quality of life in psoriasis” (Faculty of Medical Sciences, University of Kragujevac). The funder had no role in study design, data collection, analysis, interpretation, manuscript preparation, or the decision to submit for publication.

Abstract

Skindex-29 provides a domain-specific assessment of quality-of-life (QoL) burden in psoriasis, but real-world comparisons across treatment modalities and clinically relevant time points remain limited. We prospectively followed 183 adults with psoriasis (Psoriasis Area Severity Index [PASI]>10) treated with phototherapy, conventional systemic agents, or biologics in a tertiary center. Skindex-29 total and domain scores were assessed at weeks 0, 4, 12, and 16. Total scores decreased significantly within all modalities (all $p<0.001$), with earlier and larger observed reductions among patients receiving biologics. After Benjamini-Hochberg adjustment, between-group differences remained significant for total scores at weeks 0, 4, and 16; for Emotions and Functioning at weeks 0, 4, and 16; and for Symptoms at week 4. PASI was strongly correlated with all domains ($r=0.692-0.795$; all $p<0.001$). Skindex-29 may complement PASI in domain-aware monitoring, although the non-randomized design precludes causal interpretation.

Introduction

Psoriasis imposes a substantial health-related quality-of-life (HRQoL) burden beyond visible disease, making standardized patient-reported outcomes (PROs) essential alongside clinician ratings.¹ Skindex-29, a dermatology-specific tool, quantifies Symptoms, Emotions, and Functioning on a 0-100 scale with well-established reliability, validity, and interpretability.² Clinically anchored thresholds further support translating score changes into practice.³

Psychosocial load is prominent: item-level Skindex-29 analyses reveal frequent shame, anger, worry, and limits in daily/social roles even without marked objective severity.⁴ PRO trajectories do not always mirror Psoriasis Area Severity Index (PASI); real-world data show Skindex-29 can align more closely with patient-perceived severity, while baseline HRQoL and its course reflect disease duration and stress/depression.⁵ Contemporary syntheses position HRQoL as a core outcome and stress that instrument choice determines how well emotional/functional burden is detected, supporting domain-resolved Skindex-29 alongside global indices like the Dermatology Life Quality Index (DLQI).⁶

Guidelines operationalize treat-to-target reviews at $\approx 10-12$ and 16-24 weeks, adjusting therapy when targets (including HRQoL) are unmet.⁷ In practice, phototherapy and conventional systemics improve HRQoL, but biologics usually yield earlier and larger gains, especially as clearance approaches clear/almost clear, producing a steeper early decline in PRO scores.⁸⁻¹⁰ These modality-specific patterns frame interpretation of domain-level Skindex-29 trajectories in routine care.

Despite abundant efficacy data, real-world, domain-specific comparisons across phototherapy, conventional systemics, and biologics at multiple clinically relevant time points are limited. Addressing this gap clarifies which domains drive perceived benefit and when modalities diverge.⁶ We therefore prospectively assessed Skindex-29 total and domains at weeks 0, 4, 12, and 16 across the three modalities in adults with moderate-to-severe psoriasis, with secondary aims to compare trajectories and correlate with PASI. A domain-aware approach can better align treat-to-target decisions with patient-important outcomes by flagging residual emotional or functional burden even when cutaneous targets are met.^{6,7,11}

Materials and Methods

We conducted a prospective, non-interventional real-world study in adults with moderate-to-severe plaque psoriasis treated at a tertiary dermatology center. The protocol complied with the Declaration of Helsinki and was approved by the institutional Ethics Committee (No. 01.21-375; October 28, 2021); all participants gave written informed consent. Consecutive patients ≥ 18 years with PASI > 10 were enrolled during routine visits (November 2021–December 2022). Only participants with complete data at all four assessment points were included in the analysis; therefore, no follow-up data were missing within the analyzed sample, and no imputation was performed. Treatment followed clinician judgment: phototherapy, conventional systemic therapy, or biologics (concomitant topicals permitted).

Skindex-29 total and domain scores (Symptoms, Emotions, and Functioning; 0–100, with higher scores indicating worse QoL) and PASI were recorded at baseline and at weeks 4, 12, and 16 after treatment initiation. Baseline covariates included demographics, disease duration, prior systemic/biologic exposure, and key comorbidities. A target sample of ~ 180 patients was set *a priori* to ensure adequate precision for within-patient change and between-modality contrasts.

Within-modality changes in Skindex-29 total scores were assessed using repeated-measures one-factor analysis of variance (ANOVA). Between-modality differences in total and domain scores at each time point were assessed using Welch's one-way ANOVA. The resulting 16 p-values were adjusted using the Benjamini-Hochberg procedure to control the false discovery rate; significant omnibus tests were followed by Games-Howell pairwise comparisons. Sex-stratified comparisons used independent-samples *t*-tests, and associations with PASI were examined using Pearson correlations. Complete cases

were analyzed without imputation. Analyses were performed using IBM SPSS v23 and Python 3.13; adjusted two-sided $p < 0.05$ was considered significant.

Results

Of the 250 patients enrolled, 183 completed all four assessments and were included in the complete-case analysis, while 67 patients had incomplete follow-up data, corresponding to an overall attrition rate of 26.8%. Among the 183 analyzed participants, 59% were men. The mean age was 47.5 ± 14.9 years (range 18-74), with age at onset of 34.5 ± 13.7 years. Disease duration averaged 12.9 ± 10.3 years (range 1-45). Baseline PASI was 23.1 ± 6.5 , indicating predominantly moderate-to-severe disease and showing no relevant sex difference. At enrollment, 35.0% received biologics, 33.3% conventional systemic therapy, and 31.7% phototherapy. The sample reflected routine tertiary-care case-mix (cardiometabolic comorbidities and prior systemic exposure were common; education, employment, and residence varied). As this report focuses on PROs, detailed socio-demographic characteristics are summarized narratively to avoid redundancy. Modality-specific QoL results are presented below.

Over 16 weeks, Skindex-29 total scores decreased substantially within each treatment category (repeated-measures $p < 0.001$ for all; Table 1), indicating progressive improvement in dermatology-specific QoL. After Benjamini-Hochberg adjustment, between-modality differences remained significant at weeks 0, 4, and 16, but not at week 12 (Table 1). By week 16, patients receiving biologics exhibited the lowest Skindex-29 totals (*i.e.*, the most favorable QoL), whereas conventional systemic therapy and phototherapy showed higher residual burden. The trajectory suggested a steeper, earlier decline under biologics (separation already evident at week 4), partial convergence at week 12, and renewed separation by week 16.

After Benjamini-Hochberg adjustment, between-modality differences were significant for Emotions and Functioning at weeks 0, 4, and 16, and for Symptoms only at week 4; no domain differed significantly at week 12 (Table 2). Games-Howell comparisons showed that these differences were primarily driven by lower scores among patients receiving biologics, particularly at weeks 4 and 16. Convergent validity with clinical severity was supported by strong, positive correlations between PASI and Skindex-29 domains (Table 3). Correlation coefficients ranged from $r = 0.692$ (Emotions) to $r = 0.795$ (Symptoms), all $p < 0.001$, indicating that greater clinician-rated severity aligned with worse patient-reported QoL across domains. High inter-domain correlations (*e.g.*, Emotions-Functioning $r = 0.911$) underscored internal coherence of the instrument in this population.

Visual inspection of trajectories did not reveal anomalous fluctuations at intermediate time points. The non-significant comparison at week 12 for the total score (Table 1) corresponded to the period of maximal convergence across modalities, in line with domain findings (Table 2).

Discussion

Our four-time-point real-world analysis showed improvement in Skindex-29 scores across all treatment modalities, with earlier and larger observed reductions among patients receiving biologics. Between-modality differences were most pronounced for Emotions and Functioning, whereas Symptoms differed only at week 4. Skindex-29 also showed strong correlations with PASI, supporting its complementary use alongside clinician-rated severity. Assessments at weeks 0, 4, 12, and 16 are consistent with treat-to-target approaches that emphasize evaluation of both clinical response and QoL burden at clinically relevant follow-up visits.^{6,7,11}

Randomized trials and real-world studies have similarly reported rapid and substantial HRQoL improvement with interleukin (IL)-17 and IL-23 inhibitors.^{8,9,12-14} Phototherapy and conventional systemic treatments also provide meaningful QoL improvement over time, although the magnitude and timing of response may differ across treatment pathways.^{10,15,16} Although most previous studies used the DLQI rather than Skindex-29, their overall findings are consistent with the improvement observed across all three treatment modalities in our cohort.

The domain-level findings emphasize the psychological and functional burden of psoriasis. Skindex-29 captures emotional distress, stigma, limitations in social participation, and restrictions in daily activities that may not be fully reflected by symptom scores alone.^{2,4} The more pronounced between-modality differences in Emotions and Functioning may partly reflect earlier reductions in visible disease burden and associated stigma. This interpretation is consistent with evidence linking deeper skin clearance to greater HRQoL improvement.¹⁷ Symptoms became more comparable across modalities later in follow-up, suggesting that emotional and functional recovery may follow a different course from symptomatic improvement.

PASI and PROs provide related but non-identical information. Clinical improvement may not correspond to complete emotional or functional recovery, supporting the use of domain-resolved QoL assessment alongside clinician-rated severity.^{1,5} No significant between-modality differences were observed at week 12, while differences were evident again at week 16 for the total score, Emotions, and

Functioning, but not Symptoms. This temporary convergence should be interpreted cautiously because treatment allocation was not randomized and the groups differed at baseline.

Strengths and limitations

Strengths of this study include its prospective routine-care design, four prespecified assessments, and domain-specific evaluation of Skindex-29 alongside PASI.

The principal limitations are the single-center, non-randomized design and the resulting risk of confounding by indication. Baseline differences in the total score, Emotions, and Functioning indicate that the treatment groups were not fully comparable; therefore, the observed between-group differences should be interpreted as associations rather than causal effects. The 26.8% attrition rate and complete-case approach may also have introduced selection bias. Additional limitations include reliance on self-reported outcomes, the absence of formal adherence and safety monitoring, the 16-week observation period, and the less frequent use of the Skindex-29 than the DLQI in previous studies.

Implications for practice and future research

Skindex-29 may help identify residual emotional or functional burden even when cutaneous treatment targets are achieved, supporting its use alongside PASI at clinically relevant follow-up visits.^{6,7} Multicenter studies with longer follow-up should establish domain-specific thresholds for meaningful change, incorporate mental-health measures, and further evaluate the comparative effectiveness of different treatment pathways.

Conclusions

In this real-world cohort of patients with moderate-to-severe plaque psoriasis, Skindex-29 was responsive to change and distinguished observed QoL trajectories across treatment modalities. Total scores decreased in all groups, with earlier and larger observed reductions among patients receiving biologics. Emotions and Functioning showed the clearest between-modality differences, particularly at weeks 4 and 16, whereas Symptoms differed only at week 4. Skindex-29 correlated strongly with PASI, supporting its complementary use alongside clinician-rated severity. Because treatment allocation was not randomized and the groups differed at baseline, the observed between-modality differences should be interpreted as associations rather than causal treatment effects. Nevertheless, these findings support domain-aware QoL monitoring to identify residual emotional or functional burden despite cutaneous

improvement. Longer-term, multicenter comparative studies are needed to confirm these findings and refine thresholds for clinically meaningful change.

References

1. Barbieri JS, Gelfand JM. Patient-Reported Outcome Measures as Complementary Information to Clinician-Reported Outcome Measures in Patients With Psoriasis. *JAMA Dermatol* 2021;157:1236-7.
2. Chren MM. The Skindex instruments to measure the effects of skin disease on quality of life. *Dermatol Clin* 2012;30:231-36.
3. Prinsen CA, Lindeboom R, Sprangers MA, et al. Health-related quality of life assessment in dermatology: interpretation of Skindex-29 scores using patient-based anchors. *J Invest Dermatol* 2010;130:1318-22.
4. Sampogna F, Tabolli S, Abeni D. IDI Multipurpose Psoriasis Research on Vital Experiences (IMPROVE) investigators. Living with psoriasis: prevalence of shame, anger, worry, and problems in daily activities and social life. *Acta Derm Venereol* 2012;92:299-303.
5. Lee YW, Park EJ, Kwon IH, et al. Impact of Psoriasis on Quality of Life: Relationship between Clinical Response to Therapy and Change in Health-related Quality of Life. *Ann Dermatol* 2010;22:389-96.
6. Ghezzi G, Costanzo A, Borroni RG. Health-Related Quality of Life in Psoriasis: Literature Review. *J Clin Med* 2024; 13:4623.
7. Nast A, Altenburg A, Augustin M, et al. German S3-Guideline on the treatment of Psoriasis vulgaris, adapted from EuroGuiDerm - Part 1: Treatment goals and treatment recommendations. *J Dtsch Dermatol Ges* 2021;19:934-150.
8. Reich K, Augustin M, Thaçi D, et al. A 24-week multicentre, randomized, open-label, parallel-group study comparing the efficacy and safety of ixekizumab vs. fumaric acid esters and methotrexate in patients with moderate-to-severe plaque psoriasis naive to systemic treatment. *Br J Dermatol* 2020;182:869-79.
9. Papp KA, Lebwohl MG, Puig L, et al. Long-term efficacy and safety of risankizumab for the treatment of moderate-to-severe plaque psoriasis: interim analysis of the LIMMitless open-label extension trial beyond 3 years of follow-up. *Br J Dermatol* 2021;185:1135-45.

10. Gelfand JM, Armstrong AW, Lim HW, et al. Home- vs Office-Based Narrowband UV-B Phototherapy for Patients With Psoriasis: The LITE Randomized Clinical Trial. *JAMA Dermatol* 2024;160:1320-8.
11. Gisondi P, Talamonti M, Chiricozzi A, et al. Treat-to-Target Approach for the Management of Patients with Moderate-to-Severe Plaque Psoriasis: Consensus Recommendations. *Dermatol Ther (Heidelb)* 2021;11:235-52.
12. Lebwohl M, Strober B, Schrader A, et al. Six-Month Real-World Study to Assess the Effectiveness of Ixekizumab After Switching from IL-23 Inhibitors and Other Biologic Therapies: The CorEvitas Psoriasis Registry. *Drugs Real World Outcomes* 2024;11:451-64.
13. Gargiulo L, Narcisi A, Ibba L, et al. Effectiveness and safety of bimekizumab for the treatment of plaque psoriasis: a real-life multicenter study-IL PSO (Italian landscape psoriasis). *Front Med (Lausanne)* 2023;10:1243843.
14. Augustin M, Jullien D, Martin A, et al. Real-world evidence of secukinumab in psoriasis treatment - a meta-analysis of 43 studies. *J Eur Acad Dermatol Venereol* 2020;34:1174-85.
15. Milidrag A, Safiye T, Gutić M, et al. The Influence of Treatment Modalities on the Quality of Life of Psoriasis Patients. *Iran J Public Health* 2023;52:1925-34.
16. Augustin M, Barker J, Conrad C, et al. Efficacy and Safety of Apremilast Over 52 Weeks in Patients with Plaque Psoriasis in High-Impact Areas and Impaired Quality of Life. *Dermatol Ther (Heidelb)* 2025;15:1915-29.
17. Augustin M, Gottlieb AB, Lebwohl M, et al. Complete Skin Clearance is Associated with the Greatest Benefits to Health-Related Quality of Life and Perceived Symptoms for Patients with Psoriasis. *Dermatol Ther (Heidelb)* 2024;14:2841-57.

Table 1. Skindex-29 total score by treatment modality at weeks 0, 4, 12, and 16 (mean±SD).

Skindex-29	Conventional systemics	Phototherapy	Biologics	pFDR
Week 0	68.1±16.2 ^{ab}	72.8±14.9 ^a	63.2±19.9 ^b	0.021
Week 4	57.6±15.5 ^a	60.3±16.8 ^a	43.5±17.6 ^b	<0.001
Week 12	32.8±18.1	34.2±23.3	29.7±16.9	0.469
Week 16	26.7±21.4 ^a	24.9±25.9 ^b	14.4±15.6 ^b	0.002
p-value*	<0.001	<0.001	<0.001	

SD, standard deviation; pFDR, false discovery rate-adjusted p-value. Skindex-29 ranges from 0 to 100, with higher scores indicating worse QoL. *p-values from repeated-measures one-factor ANOVA within each treatment modality. pFDR values are Benjamini-Hochberg-adjusted p-values from Welch's one-way ANOVA comparing treatment modalities at each time point. Within each time point, values with different superscript letters differ significantly according to Games-Howell pairwise comparisons ($p<0.05$).

Table 2. Skindex-29 domain scores (Emotions, Symptoms, Functioning) by treatment modality at weeks 0, 4, 12, and 16 (mean±SD).

Skindex-29		Emotions	Symptoms	Functioning
Week 0	CS	75.6±18.4 ^{ab}	63.4±17.8	64.7±17.5 ^{ab}
	PHOTO	81.8±16.2 ^a	65.8±17.3	69.3±17.0 ^a
	BIO	69.6±21.3 ^b	60.0±21.4	59.8±21.5 ^b
	pFDR	0.004	0.315	0.042
Week 4	CS	66.5±18.3 ^a	49.6±16.2 ^a	55.0±16.9 ^a
	PHOTO	71.4±20.1 ^a	49.0±16.8 ^a	57.8±18.9 ^a
	BIO	49.0±19.3 ^b	39.6±17.6 ^b	41.2±19.1 ^b
	pFDR	<0.001	0.004	<0.001
Week 12	CS	41.4±22.6	26.2±18.2	29.6±18.4
	PHOTO	44.1±25.2	23.6±21.5	32.0±25.0
	BIO	35.5±19.6	25.9±17.5	27.1±17.4
	pFDR	0.113	0.762	0.469
Week 16	CS	35.8±26.8 ^a	18.8±19.0	23.8±20.9 ^a
	PHOTO	34.0±30.6 ^a	16.7±22.9	22.3±27.1 ^a
	BIO	18.8±18.2 ^b	12.3±13.3	12.0±16.5 ^b
	pFDR	<0.001	0.107	0.003

SD, standard deviation; CS, conventional systemic therapy; BIO, biologics; PHOTO, phototherapy; pFDR, false discovery rate-adjusted p-value. Skindex-29 scores range from 0 to 100, with higher scores indicating worse QoL. pFDR values are Benjamini-Hochberg-adjusted p-values from Welch's one-way ANOVA. Within each domain and time point, values with different superscript letters differ significantly according to Games-Howell pairwise comparisons ($p<0.05$).

Table 3. Pearson correlation matrix between PASI and Skindex-29 domains.

Skindex-29		Emotions	Symptoms	Functioning
PASI	r	0.692	0.795	0.745
	p	<0.001	<0.001	<0.001
Emotions	r	–	0.811	0.911
	p	–	<0.001	<0.001
Symptoms	r	–	–	0.888
	p	–	–	<0.001
Functioning	r	–	–	–
	p	–	–	–

PASI, Psoriasis Area and Severity Index. Values are Pearson's r coefficients (two-sided p-values). Higher Skindex-29 scores indicate greater impairment in QoL. "–" denotes the symmetric/duplicate cell.