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EXPERT OPINION

The Psoriatic Disease Assessment Index (PSODAI) Score to Evaluate Systemic Involvement of Psoriasis

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Background: To the best of our knowledge, no validated scoring instrument currently exists that comprehensively evaluates both cutaneous manifestations and systemic comorbidities of psoriasis. This multicenter study aimed to develop and validate a novel multidimensional scoring system addressing this clinical gap.

Methods: Under the guidance of the Shenzhen Psoriasis Academy, we conducted seven expert meetings to analyze existing evidence from PubMed, Wanfang, and CNKI databases. Through iterative Delphi consensus processes involving 26 specialists across 10 disciplines, we established the Psoriasis Disease Assessment Index (PSODAI). This 60-point composite instrument evaluates cutaneous involvement and nine key organ/system comorbidities. An accompanying online calculator (http://www.psodai.com.cn/) was developed for clinical implementation. Validation involved 254 psoriasis patients from six tertiary centers, with comparative analyses against PASI and DLQI metrics.

Results: The PSODAI framework stratifies disease severity as mild (0–20), moderate (21–40), and severe (41–60). Comparative analysis revealed comparable proportions of moderate-to-severe cases between PSODAI and conventional tools (PASI/DLQI) ($p>0.05$). Notably, 11 patients (4.3%) classified as severe by PASI were re-categorized as mild through PSODAI's systemic evaluation, primarily due to limited extracutaneous manifestations.

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Conclusion: As the first comorbidity-integrated assessment tool, PSODAI enables cross-specialty collaboration for holistic patient management. Its clinical adoption may facilitate timely comorbidity detection and preventive interventions. Further multicenter validation is warranted to confirm these preliminary findings.

Keywords: psoriasis, comorbidity, disease severity, systemic scoring, consensus

Introduction

Psoriasis is a chronic, recurrent, inflammatory, systemic disease caused by a combination of genetic and environmental factors.[1] In addition to the skin, joints, fingers/toenails, palms and soles can be involved seriously affecting the quality of life of patients, and in a considerable proportion of patients are accompanied by a variety of comorbidities.[2] With the development of psoriasis therapeutics, standard treatment should not only be to remove skin lesions but also to control psoriasis-associated comorbidities. Therefore, a practical, systematic evaluation of the patient's global condition is a mandatory step in the holistic management of psoriasis patients.

A large set of epidemiological research shows that psoriasis is associated with a variety of comorbid conditions.[3–5] A real-world study reported by Shah et al based on a total of 469,097 psoriasis patients identified 24 different comorbidities, among which the most common were hyperlipidemia, hypertension, depression, type 2 diabetes, and obesity.[6]

To now, the current psoriasis disease severity scoring tools are limited to skin lesions such as Psoriasis Area and Severity Index (PASI), Body surface area (BSA), Dermatology Life Quality Index (DLQI) and Patient Global Assessment Numerical Rating Scale (PtGA NRS) and Physician Global Assessment (PtGA).[7–10] These scoring scales do not consider the systemic impact of psoriasis, and do not take into account comorbidities. Hence, a new assessment tool addressing both cutaneous disease and comorbid conditions is urgently needed. This article reports the outcome of a multidisciplinary consensus which led to the definition of the so-called Psoriatic Disease Assessment Index (PSODAI) scoring tool, with the objective to provide a practical and reproducible tool allowing the assessment in practice of the multiple organ disease impacts.

Materials and Methods

To improve the systemic psoriasis scoring tool, which we called the Psoriatic Disease Assessment Index (PSODAI), we referred to consensus development for health professionals as developed by Bory Kea and Benjamin.[11] We followed five components:[12] three inputs, the approach (consensus development), and the output as follow:

Defining the Task

Experts from Shenzhen Psoriasis Academy decided to develop a new scoring tool which helps to evaluate the severity of psoriasis and its comorbidities. SPA is an academic group of clinicians, researchers and dermatologists from different hospitals who are actively involved in psoriasis treatment in Shenzhen City.

Identifying and Recruitment of Participants

We identified and invited experts nationally and internationally involved in treatment of psoriasis including, dermatologists and specialists from other medical disciplines, different hospitals and universities among them rheumatologists, cardiologists, nephrologists, pneumologists, endocrinologists, gastroenterologists and ophthalmologists. Identification of these experts was based on the number of publications, administrative leadership and reputation or peer consensus. We included also psoriatic patients from 6 different hospitals who were scored using PSODAI.

Information

In addition to long experience of the participants, we searched PubMed, Wanfang database and China National Knowledge Infrastructure (CNKI), reviewed a large number of psoriasis studies, discussed in depth in seven group meetings online or on-site. For psoriasis comorbidities frequency weighting, we used data from a study by Shah et al[6] which was conducted in USA.

Consensus Approach

We used an implicit approach by voting structure. After 5 months of discussion and 7 meetings, we constructed a final scheme for the PSODAI and an online application (http://www.psodai.com.cn/), which was approved during the round-table brain-storming discussion involving 26 experts from 10 medical specialties. After some comments and inputs to the initial version, all 26 experts approved it by vote.

To finalize and confirm the scientific validity of the PSODAI, we tested this new scoring method by evaluating 254 psoriatic patients from six hospitals in Shenzhen. These patients were evaluated for the first time using both commonly used methods (the PASI and DLQI) and the new PSODAI. We then compared these two scoring scales. The chi-square test was used to determine whether there was a statistically significant difference in disease severity between the PASI or DLQI, which are based only on skin lesions, and the PSODAI in view of systemic involvement. To determine whether there is a statistically significant difference between the two scoring tools (PASI/DLQI vs PSODAI) in identifying moderate-severe patients, we used McNemar's Exact Test. The level of significance was set at a p value < 0.05.

Results

Evaluation of the Grade of Each Organ

Cutaneous Dysfunction

The severity of skin involvement is assessed by two scales, the objective PASI and the subjective feeling DLQI.[7] Only higher PASI or DLQI scores were considered for scoring.

A PASI < 3 was defined as mild, with a score of 1 point; a PASI score between 3 and 9 was defined as moderate, with a score of 2 points; and a PASI score ≥10 was defined as severe, with a score of 3 points.

A DLQI < 6 is defined as mild, and 1 point is scored; a DLQI ranging from 6 to 9 is defined as moderate, with a score of 2 points; and a DLQI ≥ 10 is defined as severe, with a score of 3 points.

Cardiovascular Dysfunction

This PSODAI scoring system uses hypertension (HTA) and heart failure, the two most commonly seen conditions.

Hypertension

HTA grading standards followed the 2023 ESH Guidelines for The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension.[13] Patients with HTA were categorized, and cardiovascular risk was classified as grade 1 (1 point), grade 2 (2 points) or grade 3 (3 points) HTA.

Heart Failure

It was assessed according to the New York Heart Association (NYHA) grading standards for cardiac function:[14] grade I (0), II (1), III (2), or IV (3).

Metabolic Dysfunction

We used three evaluation criteria (blood glucose, blood lipids and uric acid) to assess the metabolic effects of psoriasis.[15–17] The highest score is included in the total score.

Skeletal Dysfunction

We used the Disease Activity Index for Psoriatic Arthritis (DAPSA) to evaluate psoriasis joint comorbidities. The following PsA activity grades were used: 0–4, remission (0 points); 5–14, low (1 point); 15–28, moderate (2 points); and >28, high disease activity (3 points).[18]

Neuropsychological Dysfunction

The Depression and Anxiety Rating Scales were used to assess the degree of psychological involvement in psoriasis patients.[19,20]

Depression

Depression was scored using the 9-item Patient Health Questionnaire (PHQ-9):[19] 5–9 points for mild depression; 10–14 points for moderate depression; 15–19 points for moderately severe depression; and >20 points for severe depression.

Anxiety

Anxiety was assessed using the Generalized Anxiety Disorder Scale (GAD-7):[20] 0–4 points as minimal anxiety scored 0; 5–9 points as mild anxiety scored 1; 10–14 points as moderate anxiety scored 2; and 15–21 points as severe anxiety scored 3.

Renal Dysfunction

We used the chronic kidney disease (CKD) score to calculate the psoriasis renal comorbidity score. According to the CKD stage and albuminuria grade, the risk stratification of CKD is 0.5 points for low risk, 1 point for moderately increased risk, 1.5 points for high risk, and 3 points for very high risk.[21]

Respiratory Dysfunction

The 2021 guidelines for the diagnosis and treatment of chronic obstructive pulmonary disease (COPD)[22,23] was used to score the degree of lung involvement associated with psoriasis: Grade 0 (0.5 points), Grade I (1 point), Grade II (1.5 points) and Grade III (3 points).

Hepatic Dysfunction

The degree of hepatic insufficiency was graded according to biochemical indexes.[24] We referred to modified Child-Pugh classification of the liver disease: class A (1.0 points), class B (2 points), and class C (3 points).[25]

Ocular Dysfunction

PSODAI uses the anatomical location classification method developed by the International Uveitis Study Group in 1987 to classify uveitis into anterior uveitis (0.5 points), intermediate uveitis (1 point), posterior uveitis (1.5 points) and panuveitis (3 points).[26]

Gastrointestinal (GI) Dysfunction

PSODAI score uses ulcerative colitis and Crohn's disease severity scores to assess psoriatic digestive comorbidities.[27,28]

Ulcerative Colitis

The severity assessment of ulcerative colitis,[29] which is mild (1 point), moderate (2 points) or severe (3 points).

Crohn's Disease

The severity assessment of Crohn's disease was mainly based on the Harvey simplified Crohn's disease activity index,[29] which indicated remission (1 point), moderate activity (2 points) and severe activity (3 points).

The Design of the PSODAI Scoring Tool

In the general plan for the systematic evaluation of psoriasis comorbidities, 10 systems, namely, skin, cardiovascular, metabolic, osteoarticular, neuropsychological, renal, pulmonary, hepatic, ocular and **g**astrointestinal tract; were included in the psoriasis systemic score. Each system was divided into 1 point, 2 points, and 3 points according to severity, for a total of 6 points. A score of zero (0) means normal body condition. Severity of some diseases was divided into 4 grades according to specific criteria, but the total score of 6 remains unchanged. Each system is scored only once, and if the system includes 2 or more comorbidities or scoring indicators, the highest score is taken into the overall assessment.

Then, each system is scored according to its severity. The incidence of psoriasis in different systems varies greatly; for example, direct addition cannot reflect the incidence or degree of psoriasis in different systems in the population. Therefore, to avoid this bias, each system score was multiplied by the corresponding frequency to obtain a weighted score. Finally, for the convenience of calculation, the weighted score is corrected and multiplied by 10 to get retained score. Then, we decided to take into calculation the value which is approximately close to 0 or 5.

The frequency of each system is based on real-world data published by Shah et al[6] in 2017 to study the comorbidity burden of psoriasis patients in the United States. The scores are shown in Table 1.

The total score for the PSODAI is 60 if all 10 systems achieve severe results. To be consistent and comparable with the current use of the PASI or DLQI, we also classified the PSODAI scores as mild, moderate or severe, as detailed below: 0<20 points: Mild; 20≤PSODAI<40 points: Moderate; 40≤PSODAI≤60 points: Severe.

Table 1 Summary of the Psoriatic Disease Assessment Index

System	Abnormality	Index	Grading	Score	Freq*	WS**	RS***
Cutaneous	PASI/DLQI	PASI=0 and DLQI=0	Normal	0	1	0	0.0
		PASI<3 or DLQI<6	Mild	1		1	10.0
		PASI:3–9 or DLQI:6–9	Moderate	2		2	20.0
		PASI≥10 or DLQI≥10	Severe	3		3	30.0
Cardio-vascular	HTA/Heart Failure	No HA/No limitation of PA	Normal	0	0.422	0	0.0
		Grade 1 HTA/SPA	Mild	1		0.422	4.0
		Grade 2 HTA/MPA	Moderate	2		0.844	8.0
		Grade 3 HTA/RPA	Severe	3		1.266	12.5
Metabolic	Hyperglycemia/Hyperlipidemia/ Hyperuricemia	Normal values	Normal	0	0.315	0	0.0
		IFG/Appropriate level / HU	Mild	1		3.15	3.0
		IGT/Marginal level/SCG	Moderate	2		6.3	6.0
		DM/Increased level/Gout	Severe	3		9.45	9.0
Osteo- articular	Joints Damage	DAPSA Score	Remission	0	0.059	0	0.0
			Low	1		0.059	0.5
			Moderate	2		0.118	1.0
			High	3		0.177	2.0
Neuropsychological	Depression/Anxiety	PHQ-9/GAD-7 scores	Normal	0	0.057	0	0.0
			Mild	1		0.057	0.5
			Moderate	2		0.114	1.0
			Severe	3		0.171	2.0
Renal	Chronic Kidney Disease	GFR ≥90	Normal	0	0.043	0	0.0
		GFR:60-90	Mild	1		0.043	0.4
		GFR; 30-59	Moderate	2		0.086	0.8
		GFR<30	Severe	3		0.129	1.0

(*Continued*)

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Table 1 (Continued).

System	Abnormality	Index	Grading	Score	Freq*	WS**	RS***
Respiratory	Chronic Obstructive Pulmonary Disease	FEV_1 ≥80%	Grade 0	0	0.074	0.0	0.0
		50%≤ FEV_1 < 80%	Grade 1	1		0.074	0.7
		30%≤FEV_1<50%	Grade 2	2		0.148	1.0
		FEV_1<30%	Grade 3	3		0.222	2.0
Liver	Hepatic function impairment	No liver disease	Normal	0	0.041	0	0.0
		Good HF	Class A	1		0.041	0.4
		Moderately Impaired HF	Class B	2		0.082	0.8
		Advanced Impaired HF	Class C	3		0.123	1.0
Gastro-intestinal	Ulcerative Colitis/Crohn's Disease	Montreal classification	Normal	0	0.009	0	0.0
			Mild	1		0.009	0.10
			Moderate	2		0.018	0.20
			Severe	3		0.027	0.30
Ocular	Uveitis	Anatomical classification	No uveitis	0	0.007	0	0.0
			AU	0.5		0.003	0.03
			IU	1		0.007	0.07
			PU	1.5		0.010	0.10
			Panuveitis	3		0.021	0.20

Note: *Frequency **Weighted score ***Retained score.

The Application of the PSODAI and Comparison with the PASI/DLQI

We evaluated a sample of 254 psoriatic patients from 6 hospitals by using the PASI and DLQI for the first time and the PSODAI for the second time. We classified the outcomes as mild, moderate or severe. For the first method, more patients had severe cutaneous involvement indicated by PASI or DLQI (94.49%), but more severe PASI/DLQI patients presented moderate scoring based on the newly assessment tool PSODAI (83.85%). It is worthy to mention that a few patients with severe skin lesions (11/240, 4.58%) may only show a mild systemic involvement. The difference between the two techniques was statistically significant (p=0.025) as shown in Table 2.

Table 2 Application of the PSODAI and Its Simultaneous Comparison to the PASI/DLQI Among 254 Patients

PSODAI / PASI/DLQI	Mild	Moderate	Severe	Total
Mild	2	3	0	5(1.97%)
Moderate	0	9	0	9(3.54%)
Severe	11	201	28	240(94.49%)
Total	13(5.12%)	213(83.85%)	28(11.03%)	254(100%)
χ^2 =14.734 p value=0.025				

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Considering the criteria of biological use on psoriasis patients with the inclusion of moderate-severe condition, among these 254 patients, the total of moderate-severe patients respectively accounted for 249 (98.03%) in the PASI/DLQI pool and 241 (94.88%) among PSODAI group, showing no significant difference (p=0.057) in the proportion of moderate-severe form, clinically consistent for the decision to consider systemic treatments including biologics.

Discussion

Psoriasis is a complex chronic inflammatory skin disease caused by the dynamic interplay between multiple genetic risk foci, environmental risk factors, and excessive immunological abnormalities. It was once thought to affect only the skin and skeletal system of the human body, but it finally has been confirmed that psoriasis is a systemic inflammatory disease involving multiple systems.[30] TNF-α and other inflammatory mediators can expose the body to chronic systemic inflammatory conditions that can induce insulin resistance, endothelial cell dysfunction and related cardiovascular diseases, as well as other comorbid diseases, such as MetS, CKD, and gastric or intestinal disorders and malignancies.[30–33]

Approximately 10 to 30% of patients with psoriasis develop PsA.[34] PsA is an important subtype of psoriasis that requires the joint attention and management of dermatologists and rheumatologists. In addition, previous studies have shown that patients with PsA are more likely to have eye complications than are those with psoriasis. Routine eye examination is recommended for patients with PsA.[35,36] Also, patients with PsA have a greater incidence of cardiovascular disease and MetS than other patients with inflammatory arthritis.[37]

Diverse risk factors; social (smoking, alcohol, physical activity); environmental (obesity), psychological (stress) are shared by psoriasis and cardiovascular diseases.[38,39] Cardiovascular risk factors, such as hypercholesterolemia, diabetes, HTA, alcohol excess, and chronic kidney disease, should be screened for early psoriatic patients. Patients with psoriasis should be screened for these factors to avoid early occurrence of cardiac insufficiency or HTA. Obesity, type 2 diabetes, and insulin resistance are associated with inflammatory pathways involving specific inflammatory cytokines, such as TNF-α and IL-6, which are significantly elevated in psoriasis.[40]

Studies of related adipokines (such as leptin) have also indirectly confirmed the link between psoriasis and endocrine system diseases.[41,42] Hyperleptinemia in psoriasis patients may be one of the causes of MetS.[43]

Psoriasis seriously affects the mental health of patients, and the risk ratio of depression is approximately 1.4~1.5 and increases with increasing disease severity.[44,45] In patients with psoriasis, depression is associated with an increased risk of myocardial infarction, stroke, and cardiovascular death events, especially during acute depression.[46]

At present, traditional scores for the severity of psoriasis, such as the PASI, BSA, DLQI, and PtGA, only assess and determine the severity of skin lesions.[7,10,] However, the relevant standards for the overall assessment of psoriasis and its comorbidities are still lacking. To overcome this issue, we constructed a scoring method that includes all organs/systems targeted by psoriatic disease. The PSODAI considers not only skin lesions but also comorbid or systemic diseases associated with psoriasis. The PSODAI is the sum of points obtained by adding the maximum score for each system as follows: 30 points for skin, 12.5 points for cardiovascular, 9 points for endocrine, 1.5 points for osteoarticular, 1.5 points for neuropsychological, 1 point for urinary, 2 points for respiratory, 2.3 points for digestive and 0.2 points for eyes. The total score is 60 points. After obtaining scores from 10 organs/systems, the PSODAI classifies psoriatic disease into three forms as follows: mild, 0 to 20 points; moderate, >20–40 points; and severe, >40–60 points. If the retained score is zero, it will mean a normal body condition.

To confirm the accuracy of this scoring method for psoriatic disease, we evaluated a sample of 254 patients from 6 hospitals who were evaluated using traditional methods (PASI and DLQI). The evaluation results of the two methods were significantly different (p value=0.025). More patients (94.49%) had severe skin lesions according to the PASI or DLQI, and many patients (83.85%) are found to be moderate systemically evaluated by PSODAI method. The PSODAI plays a particular role in that case because, in addition to showing the severity of psoriasis and skin lesions, it can also show which comorbid disease the patient has and its severity. This will lead the physician who will consider the score to manage treatment or transfer patients if needed. This will also remind clinicians to begin early background treatment, such as biological treatment, to prevent the appearance of new comorbidities or worsening of existing comorbidities in psoriatic patients.

Limitations and Strengths

The formulation of this psoriatic disease scoring tool has some shortcomings, including but not limited to: (1) We used data from a study by Shah et al (2017)[6] as reference for comorbidity frequency weighting. We basically made PSODAi referred to psoriasis vulgaris, the most common type of psoriasis which made difficult the correlation between different types of psoriasis and their score. Relying on one source for weighting may introduce bias. To our knowledge, this study remains of its kind with a sufficient sample size which shows different comorbidities related to psoriasis. We made a first step and recommend other studies which may or not adjust our application. (2) The PSODAI includes scoring for 10 systems, which may be overly complex and time-consuming for clinical application. We made online software which will help to fulfill this gap. (3) Even if we tested PSODAI on a sample of 254 patients from 6 different hospital of Shenzhen to validate it, the sample size is relatively small. We suggest more studies with larger and diverse patient population to strengthen PSODAI generalizability (4).

Conclusion

We developed a new severity scoring tool for systemic psoriasis, including 10 systems, which opens new perspectives for the exploration in practice of comprehensive and objective multidimensional evaluation of psoriasis including comorbidities by dermatologists and transdisciplinary specialists. After head-to-head real-world study in 254 patients, we found PSODAI is mostly consistent with PASI, with more accurate systemic evaluation. Such rigorous approach aims to improve the systematized concept of global management of psoriasis patients at an early stage of the disease.

IRB Approval Status

Reviewed and approved by Shenzhen Hospital of Southern Medical University IRB; approval number: NYSZYYCT2020017.

Abbreviations

PSODAI, Psoriatic Disease Assessment Index; GFR, Glomerular filtration rate; PASI, Psoriasis Area and Severity Index; DLQI, Dermatology Life Quality Index; HTA, Hypertension; PA, Physical Activity; SPA, Slight limitation of physical activity; MPA, Marked limitation of physical activity; RPA, Limitation of physical activity at rest; IFG, Impaired Fasting Glucose; IGT, Impaired glucose tolerance; DM, Diabetes mellitus; HU, Hyperuricemia; SCG, Subclinical gout; DAPSA, Disease Activity Index for Psoriatic Arthritis; PHQ, Patient Health Questionnaire; GAD, Generalized Anxiety Disorder; GOLD, Global Initiative for Chronic Obstructive lung Disease; FEV1, Forced Expiratory Volume in the first second of expiration; HF, Hepatic Function.

Data Sharing Statement

Data are available to the corresponding author and can be obtained upon written request.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Patient Consent

Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patients to publish this paper.

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Disclosure

Dr Hervé Bachelez reports personal fees from Anaptysbio, Boehringer Ingelheim, Eli Lilly, Janssen, Novartis, Sanofi, and UCB, outside the submitted work. The authors declare no other conflicts of interest in this work.

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