ANNALS OF MEDICINE
2023, VOL. 55, NO. 1, 2231847
https://doi.org/10.1080/07853890.2023.2231847

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RESEARCH ARTICLE

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Life quality among psoriasis patients based on Dermatology Life Quality Index evaluation and its association with psoriasis severity in China: a cross-sectional study

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ABSTRACT

Background: Psoriasis critically influences the psychosocial well-being of patients and reduces their quality of life and work efficiency beyond skin symptoms. However, evidence on the association between life quality based on the Dermatology Life Quality Index (DLQI) and psoriasis severity is limited, particularly in China. This study aimed to explore the association between life quality based on the DLQI evaluation and disease severity among psoriasis patients in China.

Methods: Four thousand two hundred and thirty psoriasis patients were recruited from the Chinese National Clinical Research Center for Skin and Immune Diseases from 2020 to 2021. Information was collected by applying a structured questionnaire and onsite physical examination. Data analysis was performed by using SAS software (version 9.4; SAS Inc., Cary, NC), and statistical significance was set at $p < .05$.

Results: Four thousand two hundred and thirty psoriasis patients were predominantly male (64.6%), with a median age of 38.6 years (interquartile range (IQR): 30.0–50.9). The Psoriasis Area and Severity Index (PASI) score for patients with psoriasis was 7.2 (IQR: 3.0–13.5), and 50% of patients with PASI scored over 7. A total of 84.1% of psoriasis patients reported that psoriasis affected their quality of life from mild to severe. The DLQI scores among psoriasis patients were positively correlated with PASI scores ($r = 0.43$, $p < .01$), both in patients of different sex and different age. Logistic regression analysis with the adjustment of potential confounders indicated that patients with higher PASI score also had higher DLQI score, the odds ratio (OR) were 1.69 (95% confidence interval (CI): 1.38–2.08) for patients with PASI score 3–7, 2.61 (95% CI: 2.10–3.25) for patients with PASI score 8–11 and 3.36 (95% CI: 2.78–4.07) for patients with PASI score ≥12, compared with patients with PASI score <3, respectively.

Conclusions: Life quality based on DLQI evaluation positively correlated with disease severity among patients with psoriasis, especially among male patients and those with higher body mass index. Therefore, we recommend that clinicians treat the DLQI as an important indicator during patient treatment.

ARTICLE HISTORY
Received 23 March 2023
Revised 8 May 2023
Accepted 27 June 2023

KEYWORDS
Psoriasis severity; Dermatology Life Quality Index; Psoriasis Area and Severity Index; quality of life; association

Introduction

Psoriasis is an immune-mediated and relapsing-remitting inflammatory disease, which considerably decreases patients' health-related quality of life [1,2]. The prevalence of psoriasis in adults ranges from 0.51% to 11.43% globally [3], and psoriasis affects approximately 6 million people in China [4]. The disease burden is multifaceted, involving non-communicable comorbidities, which increase the substantial risk of early mortality and the occurrence of psychiatric disorders (especially depression, anxiety or suicide) [5,6]. Currently, many effective therapies for psoriasis are applied into clinical practice. The therapeutic landscape for psoriasis has been significantly transformed

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by the introduction of biologics. These novel treatments have demonstrated considerable impact on patient's quality of life [7–10]. However, psoriasis remains an incurable disease, and many patients still require long-term treatment in their life time [2]. Therefore, minimizing the burden associated with psoriasis is important to improve the life quality among patients with psoriasis [11].

Assessing disease severity in psoriasis is a complex clinical process involving both subjective and objective measurements. Clinicians widely use the Psoriasis Area and Severity Index (PASI) score as the gold standard for assessing psoriasis severity, and treat the decreased level of PASI score (PASI 75, PASI 90 and PASI 100) as the core goal for psoriasis disease treatment [12,13]. Recently, quality of life has emerged as a critical outcome in clinical studies, and there has been a growing interest in the evaluation of quality of life among patients with skin diseases based on the Dermatology Life Quality Index (DLQI) [14]. Psoriasis can influence quality of life by restricting personal daily activities, impairing social and psychological well-being, and even affecting family members. Feelings of guilt and shame are more likely to increase the risk of depression than other cutaneous diseases and even lead to suicidal thoughts, especially among patients with moderate to severe psoriasis [3,15]. However, dermatologists pay less attention to the DLQI dimension during disease evaluation. Thus, we should emphasize the association between psoriasis severity and impaired physical and social functioning, as well as psychological distress [16], and minimize the emotional, mental and physically disabling conditions linked to psoriasis [17].

Although previous studies have examined the impact of psoriasis on the quality of life [15], evidence on the association between PASI and DLQI is still limited, especially in China. In this study, we aimed to understand disease severity based on PASI and quality of life based on the DLQI, and to explore the association between PASI and DLQI among patients with psoriasis.

Methods

Data source

Data in this observational study were derived from the National Clinical Research Center for Skin and Immune Diseases (NCRCSID) of China. In the NCRCSID, we collected extensive real-world data on psoriasis from 2020 to 2021 among 200 hospitals in all seven regions of China. Patients aged ≥18 years with a clinical diagnosis of psoriasis who received a standardized personal interview with informed consent were recruited in this study. Detailed information for study site selection was reported in our previous study [4], and a total of 4230 patients were included in the final analysis. This study was approved by the Institutional Review Boards of Peking University First Hospital (2020-255), and Shanghai Skin Diseases Hospital (2021-27). This study strictly adhered to the Declaration of Helsinki and STROBE statement.

Diagnostic, inclusion and exclusion criteria for psoriasis

In this study, the latest clinical dermatology guidelines for psoriasis diagnosis were utilized, which were in line with the global guidelines for psoriasis diagnosis and treatment, and patients meeting the diagnostic criteria were included in the study [18]. In this study, the inclusion criteria for psoriasis were patients aged 18–65 years for both sexes, and met the clinical criteria for psoriasis, the exclusion criteria for psoriasis were patients with neurological complications or mental abnormalities, or who were unable to provide informed consent.

Data collection

In this study, data were collected through a questionnaire administered by local dermatologists after a uniform training procedure in 2020 and 2021. The questionnaire consisted of (1) demographic characteristics including age, sex, marital status, education, body mass index (BMI), regions, medical insurance and tobacco smoking status; (2) information on psoriasis severity, seasonality of psoriasis aggravation, types of psoriasis, and family history of psoriasis; and (3) life quality based on the DLQI scale evaluation, which covers 10 items.

Definition and classification

In this study, the age of the patients was categorized as <30 years, 30–39 years, 40–49 years and ≥50 years. Education was recorded as completed years of schooling and categorized as 6–9 years (primary or junior high school), 10–12 years (senior high school) or >12 years (college and above). BMI was calculated as weight (kg)/height2 (m) and was categorized as lower body weight (<18.5), normal body weight (18.5–23.9), overweight (24.0–27.9) and obesity (≥28.0). The region was classified as Northeast of China, East of China,

North of China, Middle of China, South of China, Southwest of China and Northwest of China. Tobacco smoking was defined as having smoked at least 100 cigarettes in their lifetime.

PASI was used to assess the severity of the psoriasis lesions, both in the lesion area and lesion severity. The lesion area score was evaluated in 6 points: 0 points, not involved; 1 point, <10%; 2 points, 10–29%, 3 points, 30–49%, 4 points, 50–69%, 5 points, 70–89% and 6 points, 90–100%. Lesion severity is a comprehensive assessment of erythema, desquamation (scale) and infiltration degree of body parts, which is divided into four points for all three indices: 0 points for not involved, 1 point for mild, 2 points for moderate, 3 points for severe and 4 points for extremely severe. In each body part, the sum of erythema, desquamation and infiltration severity scores was multiplied by the lesion area score and then multiplied by the weight of the body part (10% for head and neck, 20% for upper limb, 30% for trunk and 40% for lower limb) to obtain a body part value; then, all four body parts were combined to obtain the total PASI score. The PASI score ranges from 0 to 72 with a higher score indicating more severity of psoriasis, we then categorized the PASI score into four categories by its quartile values: less than 3.0 for quartile 1, 3.0–7.0 for quartile 2, 7.1–13.0 for quartile 3 and over 13.0 for quartile 4 [19].

The DLQI assessment tool measures how quality of life is affected by skin problems in the past week. The DLQI includes 10 items in seven dimensions: symptoms (Q1), feelings (Q2), daily activities (Q3, Q4), leisure and exercise (Q5, Q6), work or study (Q7), social interaction (Q8, Q9) and treatment (Q10). Patients answered these 10 questions on a scale of 0–3 (0 (not at all), 1 (mild), 2 (severe) and 3 (extremely severe)) based on their performance over the past week. The total DLQI score is 30, with higher scores indicating greater impairment of quality of life. In this study, the DLQI score was classified as 0–1 (no affected), 2–5 (mild affected), 6–10 (moderate affected) and >10 (severe affected), and a severe affected life quality among psoriasis patients was identified when the total DLQI score equalled or exceeded 10 [17].

Statistical analysis

Data analysis was performed using SAS 9.4 (SAS Inc., Cary, NC) in this study. Quantitative variables were expressed as mean and standard deviation (SD) or median and interquartile range (IQR), as appropriate, and *t*-tests or Mann–Whitney's *U*-tests were used to test for significance between variables with a normal or skewed distribution. Qualitative variables were expressed as frequencies and proportions (%), and the Chi-square test was used to determine statistical differences between the groups. Logistic regression (LR) was applied to calculate the odds ratios (ORs) and 95% confidence intervals (CIs) to explore the association between quality of life based on the DLQI evaluation and disease severity (PASI scores) among patients with psoriasis. Scatter plot and Spearman's coefficient (*r*) were used to show the correlation between PASI and DLQI scores among all psoriasis patients, as well as among patients of different sexes and different ages. In this study, we set a p value less than .05 as statistically significant.

Results

In this study, we ultimately enrolled 4230 psoriasis patients, and the proportion of male patients (2734, 64.6%) was predominantly higher than that of female patients (1496, 35.4%). The median age of psoriasis patients was 37.5 years (IQR: 30.0–50.9) and 75.1% were married. In this study, 35.3% of the patients had college or higher education, 48.5% were overweight or obese, 97.3% had medical insurance and 32.9% were tobacco smokers. The data in Table 1 indicate that male patients were older, had a higher proportion of college and above education, had more overweight or obesity problems, and had a higher prevalence of tobacco smoking than female patients; the differences were all statistically significant ($p < .01$).

Dermatological feature of psoriasis patients

The median PASI score among the 4230 patients was 7.2 (IQR: 3.0–13.5), and 50% of patients had a PASI score over 7. The Chi-square test indicated that male patients had higher PASI scores than female patients ($p < .01$). Table 2 indicates that the median value of PASI score among psoriasis patients was 5.0 (IQR: 3.0–6.0) for lower limb, 4.0 (IQR: 2.0–6.0) for trunk and upper limb and 3.0 (IQR: 0.0–6.0) for head and neck, and male patients had higher PASI scores than female patient for all four body parts ($p < .01$). In this study, the season of disease aggravation among psoriasis patients was predominantly winter (46.9%) and autumn (20.9%), and 93.3% of patients were diagnosed with psoriasis vulgaris. Meanwhile, 15.8% of patients had a family history of psoriasis, and female patients reported a higher proportion of a family history of psoriasis than male patients, but the difference was not statistically significant ($p > .05$).

Table 1. The demographic feature of psoriasis patients in China, 2020–2021.

Variables	Total psoriasis patients (n = 4230)	Patient with different gender		p
		Male patient (n = 2734)	Female patient (n = 1496)	
Age (years)[a], median (IQR)	37.5 (30.0–50.9)	38.4 (30.0–51.1)	35.8 (28.7–50.4)	.000
Age (years)[a], n (%)				.002
<30	1049 (24.8)	632 (23.1)	417 (27.9)	
30–39	1317 (31.1)	855 (31.3)	462 (30.9)	
40–49	745 (17.6)	513 (18.8)	232 (15.5)	
≥50	1119 (26.5)	734 (26.9)	385 (25.7)	
Marital status, n (%)				.587
Unmarried	1051 (24.9)	672 (24.6)	379 (25.3)	
Married	3179 (75.1)	2062 (75.4)	1117 (74.7)	
Education[a], n (%)				.006
Junior high and lower	1320 (31.2)	807 (29.5)	513 (34.3)	
Senior high	1419 (33.6)	936 (34.2)	483 (32.3)	
College and above	1491 (35.3)	991 (36.3)	500 (33.4)	
BMI (kg/m^2)[a], median (IQR)	23.9 (21.6–26.6)	24.3 (22.3–26.9)	22.9 (20.6–25.6)	.000
BMI (kg/m^2)[a], n (%)				.000
<18.5 (lower body weight)	180 (4.3)	58 (2.1)	122 (8.2)	
18.5–23.9 (normal body weight)	1999 (47.3)	1199 (43.9)	800 (53.5)	
24.0–27.9 (overweight)	1329 (31.4)	992 (36.3)	337 (22.5)	
≥28 (obesity)	722 (17.1)	485 (17.7)	237 (15.8)	
Regions[a], n (%)				.001
Northeast of China	516 (12.2)	296 (10.8)	220 (14.7)	
East of China	789 (18.7)	554 (20.3)	235 (15.7)	
North of China	1157 (27.4)	759 (27.8)	398 (26.6)	
Middle of China	714 (16.9)	455 (16.6)	259 (17.3)	
South of China	591 (13.9)	380 (13.9)	211 (14.1)	
Southwest of China	162 (3.8)	99 (3.6)	63 (4.2)	
Northwest of China	301 (7.1)	191 (6.9)	110 (7.4)	
Medical insurance, n (%)				.894
Yes	4115 (97.3)	2659 (97.3)	1456 (97.3)	
No	115 (2.7)	75 (2.7)	40 (2.7)	
Smoking status[a], n (%)				.000
Non-smokers	2840 (67.1)	1424 (52.1)	1416 (94.7)	
Smokers	1390 (32.9)	1310 (47.9)	80 (5.3)	

IQR: interquartile range.
[a]The difference between male and female patients was statistically significant ($p < .05$).

Table 2. The psoriasis severity, family history, seasonality aggravation and skin damage condition among psoriasis patients in China, 2020–2021.

Variables	Total patients (n = 4230)	Male patients (n = 2734)	Female patients (n = 1496)	P
PASI score[a], (median, IQR)	7.2 (3.0–13.5)	8.2 (3.6–14.8)	5.5 (2.4–12.2)	.001
PASI score[a], n (%)				.000
<3	1040 (24.6)	565 (20.7)	475 (31.8)	
3–7	1073 (25.4)	687 (25.1)	386 (25.8)	
8–11	728 (17.2)	478 (17.5)	250 (16.7)	
≥12	1389 (32.8)	1004 (36.7)	385 (25.7)	
Psoriasis severity (erythema/infiltration/ scales) (median, IQR)				
Head and neck total score[a]	3.0 (0.0–6.0)	3.0 (1.0–6.0)	3.0 (0.0–6.0)	.000
Trunk total score[a]	4.0 (2.0–6.0)	5.0 (2.0–6.0)	4.0 (0.0–6.0)	.000
Upper limb total score[a]	4.0 (2.0–6.0)	4.0 (3.0–6.0)	3.0 (2.0–6.0)	.000
Lower limb total score[a]	5.0 (3.0–6.0)	6.0 (3.0–7.0)	4.0 (3.0–6.0)	.000
Seasons of psoriasis aggravation, n (%)				
Spring	682 (16.1)	427 (15.6)	255 (17.1)	.228
Summer	329 (7.9)	229 (8.4)	100 (6.7)	.050
Autumn	886 (20.9)	571 (20.9)	315 (21.1)	.896
Winter[a]	1987 (46.9)	1327 (48.5)	660 (44.1)	.006
Types of psoriasis, n (%)				
Psoriasis vulgaris	3945 (93.3)	2552 (93.3)	1393 (93.1)	.777
Psoriasis erythroderma[a]	140 (3.3)	106 (3.9)	34 (2.3)	.005
Psoriasis arthritis	117 (2.8)	82 (3.0)	35 (2.3)	.211
Localized herpetic psoriasis[a]	87 (2.1)	44 (1.6)	43 (2.9)	.006
Generalized herpetic psoriasis	59 (1.4)	34 (1.2)	25 (1.7)	.257
Family history of psoriasis patients, n (%)				.415
Yes	669 (15.8)	414 (15.1)	255 (17.1)	
No	3153 (74.5)	2062 (75.4)	1091 (72.9)	
Unknown	408 (9.7)	258 (9.4)	150 (10.0)	

IQR: interquartile range.
[a]The differences between male and female psoriasis patients were statistically significant ($p < .05$).

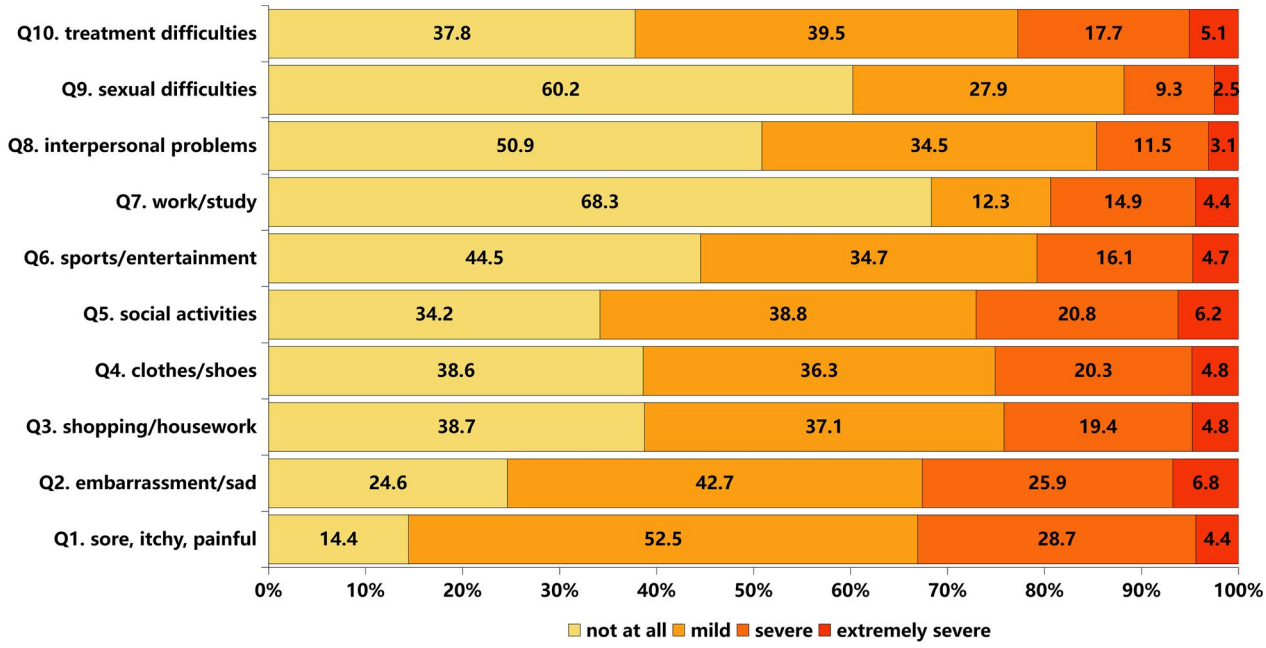

Figure 1. The proportion of responses to each 10 items in Dermatology Life Quality Index (DILQ) among psoriasis patients in China.

Life quality based on DLQI evaluation among psoriasis patients

Figure 1 shows the detailed responses of patients to each item of the DLQI questionnaire. In the 10 items of the DLQI, psoriasis-related symptoms (Q1, 85.6%), negative feelings (Q2, 75.4%), affected social activities (Q5, 65.8%) and treatment-induced life difficulties (Q10, 62.2%) were the most frequently reported items that were affected by psoriasis and mainly contributed to a higher DLQI score.

In this study, the median value of the DLQI score among patients was 8 (IQR: 3–13), and 32.4% (1369/4260) of patients with psoriasis had DLQI scores >10. Table 3 indicates that patients aged 30–39 years had a higher DLQI score, with a median value of 9 (IQR: 3–13) and the proportion of DLQI >10 was 34.9%. Male patients had higher DLQI scores than female patients, and the proportion of patients with DLQI >10 was higher in male patients (33.4%) than in female patients (30.6%), and the difference was statistically significant ($p < .05$). Moreover, psoriasis patients with higher PASI scores tended to had higher proportion of DLQI >10, which was 18.9% for PASI score < 3, 28.2% for PASI score 3–7, 37.1% for PASI score 8–11 and 43.2% for PASI score ≥12, the difference was statistically significant ($p < .05$). In this study, married patients had a lower proportion of DLQI >10 than unmarried patients, patients with tobacco smoking had a higher proportion of DLQI >10 than patients without smoking, and patients with senior high education and BMI ≥24 also had a higher proportion of DLQI >10, but the differences were not statistically significant ($p > .05$).

The association between DLQI score and PASI score

In this study, univariate LR indicated that patients with PASI score 3–7, PASI score 8–11 and PASI score ≥12 had higher proportion of DLQI >10 than patients with PASI score <3. The OR was 1.68 (95% CI: 1.37–2.06), 2.52 (95% CI: 2.03–3.13) and 3.25 (95% CI: 2.70–3.93), respectively. Multivariate LR analysis with the adjustment of potential confounders also indicated that patients with higher PASI score also had higher DLQI score; the OR was 1.69 (95% CI: 1.38–2.08) for patients with PASI score 3–7, 2.61 (95% CI: 2.10–3.25) for patients with PASI score 8–11, and 3.36 (95% CI: 2.78–4.07) for patients with PASI score ≥12, compared with patients with PASI score <3, respectively (Table 4).

The scatter plot in Figure 2 shows a positive correlation between the PASI and DLQI scores, with a correlation coefficient of 0.43 based on linear regression analysis ($p < .01$). The findings of the positive correlation between PASI and DLQI were consistent in male and female patients as well as among patients in different age groups.

Table 3. The life quality among psoriasis patients based on Dermatology Life Quality Index (DLQI) evaluation in China, 2020–2021.

Variables	DLQI scores (n = 4230)	DLQI scores by group (n, %)			
		0–1 (n = 671)	2–5 (n = 937)	6–10 (n = 1253)	>10 (n = 1369)
Age (years), median (IQR)					
<30	7 (3–12)	164 (15.6)	265 (25.3)	288 (27.5)	332 (31.7)
30–39	9 (3–13)	198 (15.0)	265 (20.1)	395 (29.9)	459 (34.9)
40–49	8 (3–12)	113 (15.2)	165 (22.2)	221 (29.7)	246 (33.0)
≥50	8 (3–12)	196 (17.5)	242 (21.6)	349 (31.2)	332 (29.7)
Gender[a], median (IQR)					
Male	8 (3–13)	442 (16.2)	570 (20.9)	810 (29.6)	912 (33.4)
Female	7 (3–12)	229 (15.3)	367 (24.5)	443 (29.6)	457 (30.6)
Marital status, median (IQR)					
Unmarried	8 (3–13)	150 (14.3)	254 (24.2)	292 (23.3)	355 (33.8)
Married	8 (3–12)	521 (16.4)	683 (21.5)	961 (30.2)	1014 (31.9)
Education, median (IQR)					
Junior high and lower	8 (3–12)	231 (17.5)	272 (20.6)	396 (30.0)	421 (31.9)
Senior high	8 (3–13)	215 (15.2)	319 (22.5)	408 (28.8)	477 (33.6)
College and above	8 (3–12)	225 (15.1)	346 (23.2)	449 (30.1)	471 (31.6)
BMI (kg/m^2), median (IQR)					
<18.5 (lower body weight)	6 (3–11)	29 (16.1)	47 (26.1)	58 (32.2)	46 (25.6)
18.5–23.9 (normal body weight)	8 (3–12)	329 (16.5)	441 (22.1)	591 (29.6)	638 (31.9)
24.0–27.9 (overweight)	8 (3–12)	206 (15.5)	292 (21.9)	396 (29.8)	435 (32.7)
≥28 (obesity)	8 (3–14)	107 (14.8)	157 (21.8)	208 (28.8)	250 (34.6)
Medical insurance, median (IQR)					
Yes	8 (3–13)	651 (15.8)	906 (22.0)	1214 (29.5)	1344 (32.7)
No	6 (3–13)	20 (17.4)	31 (26.9)	39 (33.9)	25 (21.7)
Smoking status, median (IQR)					
Non-smokers	8 (3–12)	450 (15.9)	625 (22.0)	861 (30.3)	904 (31.8)
Smokers	8 (3–13)	221 (15.9)	312 (22.5)	392 (28.2)	465 (33.5)
PASI score[a], median (IQR)					
<3	4.5 (1–9)	286 (27.5)	289 (27.8)	268 (25.8)	197 (18.9)
3–7	8 (3–11)	177 (16.5)	261 (24.3)	333 (31.0)	302 (28.2)
8–11	9 (4–13)	82 (11.3)	159 (21.8)	217 (29.8)	270 (37.1)
≥12	9 (5–16)	126 (9.1)	228 (16.4)	435 (31.3)	600 (43.2)

IQR: interquartile range.
[a]The difference between male and female patients was statistically significant (p < .05).

Table 4. The percentage of DLQI score >10 and potential influencing factors of the higher DLQI score among psoriasis patients in China, 2020–2021.

Variables	Percentage of DLQI score >10, n (%)	Model 1		Model 2	
		OR	95% CI	OR	95% CI
Age (years), median (IQR)					
<30	332 (31.7)	1.00	–	1.00	–
30–39	459 (34.9)	1.16	0.97–1.37	1.08	0.90–1.29
40–49	246 (33.0)	1.07	0.87–1.30	0.93	0.75–1.14
≥50	332 (29.7)	0.91	0.76–1.09	0.76	0.63–0.92
Gender, median (IQR)					
Male	912 (33.4)	1.00	–	1.00	–
Female	457 (30.6)	0.88	0.77–1.01	0.97	0.83–1.14
BMI (kg/m^2), median (IQR)					
<18.5 (lower body weight)	46 (25.6)	1.00	–	1.00	–
18.5–23.9 (normal body weight)	638 (31.9)	1.37	0.96–1.93	1.35	0.94–1.94
24.0–27.9 (overweight)	435 (32.7)	1.42	1.00–2.02	1.35	0.93–1.96
≥28 (obesity)	250 (34.6)	1.54	1.07–2.23	1.47	1.01–2.16
Medical insurance, median (IQR)					
Yes	25 (21.7)	1.00	–	1.00	–
No	1344 (32.7)	1.74	1.12–2.73	1.76	1.12–2.78
PASI score, median (IQR)					
<3	197 (18.9)	1.00	–	1.00	–
3–7	302 (28.2)	1.68	1.37–2.06	1.69	1.38–2.08
8–11	270 (37.1)	2.52	2.03–3.13	2.61	2.10–3.25
≥12	600 (43.2)	3.25	2.70–3.93	3.36	2.78–4.07

OR: odds ratio; CI: confidence interval; IQR: interquartile range; PASI: psoriasis severity and severity index; DLQI: Dermatology Life Quality Index.
Model 1: univariate logistic regression; model 2: multivariate logistic regression.

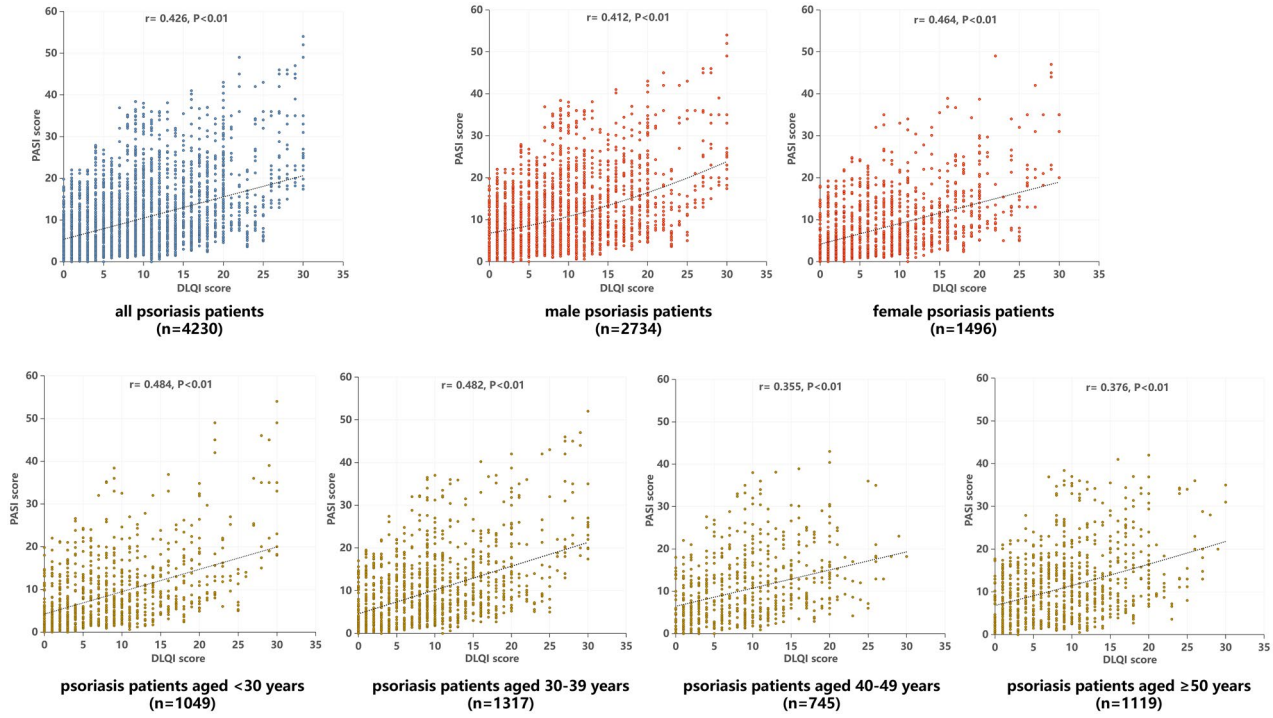

Figure 2. The association between PASI score and DLQI score by gender and by age among patients in China.

Discussion

To the best of our knowledge, this study is among the largest in China, involving 4230 patients with psoriasis, aiming to investigate the correlation between quality of life based on DLQI and psoriasis severity based on PASI. This considerable sample size provides a unique opportunity to gain deeper insights into the relationship between these two important aspects of psoriasis management. Psoriasis has a significant impact on quality of life by influencing daily activities, social functioning and psychological well-being throughout the patient's lifetime. This study showed that the DLQI score was positively correlated with the PASI score, which indicated that patients with heavier psoriasis severity tended to have worse quality of life, which was similar to previous studies [5,17]. In this study, over 84% of the patients reported that psoriasis affected their quality of life from mild to severe. The reduction in quality of life among psoriasis patients might be due to the recurrence of psoriasis, the resistance response to treatment, long-term treatment-induced heavy financial burdens, anxiety, depression, low self-esteem, and the social stigmatization of psoriasis, which even tends to generate suicidal thoughts among patients, which also significantly impairs their quality of life [15,20,21]. The findings of this study demonstrated that psoriasis severity had a negative impact on the quality of life among psoriasis patients, which should be paid more attention in the process of patient treatment and management.

DLQI is a comprehensive measure of the psychometric properties of psoriasis, which could capture the effect of clinical severity on the quality of life of patients with psoriasis in the simplest and most probable manner [22,23]. This study highlighted several findings of life quality issues in patients with psoriasis based on the DLQI evaluation, which confirmed that embarrassment, sadness, social activity difficulties and treatment difficulties were prominent quality issues induced by psoriasis. First, the proportion of patients with psychological embarrassment or sadness was high, indicating that psoriasis severely affected the psychological well-being of psoriasis patients, which was in line with previous studies, especially in patients with a long disease duration and young age [24]. Second, social activities among psoriasis patients were also severely affected, which was another important reason for the reduction in quality of life. In Chan's study, patients with moderate-to-severe psoriasis had a significant reduction in social activities by 15–20% after the diagnosis of psoriasis [25]. Third, psoriasis imposes a significant financial burden because of the long treatment time and heavy treatment cost [26]. Moreover, the DLQI is an important index to reflect the psychiatric recovery condition among patients because patients who achieved improvement in PASI might not necessarily show a decrease in DLQI scores. Therefore, dermatologists should emphasize physical

and social functioning and psychological distress among patients with psoriasis and minimize the emotional, mental and physically disabling conditions linked to psoriasis [17].

In most studies, the PASI and DLQI were used as the primary outcome measures to evaluate clinical efficacy after treatment. With the standardized use of the DLQI in clinical trials, the relationship between the change in PASI and the improvement of DLQI has been recognized. In this study, 50% of patients had a PASI score >7, and over 30% of patients had a DLQI score >10. Logistic regression analysis showed that patients with a PASI score ≥12 had 3.36 times of higher probability of having a DLQI score >10 than those with a PASI score <3, which confirmed that a higher psoriasis score represented worse quality of life among patients with psoriasis. Some studies demonstrated that a reduction in PASI predicted a corresponding reduction in DLQI, which was in line with the findings in this study [27,28]. Psoriasis in hard-to-treat areas such as scalp [29], genitalia [30], palms and soles [31] is usually considered complicated due to the insufficient penetration of the active components of drugs, leading to severe impairment of patients' quality of life. In fact, such areas certainly had a greater impact on quality of life, even if the lesions were not extensive. Therefore, it is essential to pay greater attention to the DLQI among patients with psoriasis and lesions at special sites.

In this study, male patients accounted for 64.6% of all cases and had higher PASI scores than did female patients. However, the various dimensions of quality of life from mild to extremely severe based on DLQI in female patients (84.7%) were slightly more affected by psoriasis than in male patients (83.8%). In terms of common sense, females tend to be more invested in their appearance and experience psoriasis disease more negatively than males, so female psoriasis patients usually report lower quality of life than male patient [32]. In addition, stress research indicated that females were more susceptible to stress, which exerted a stronger effect on quality of life in terms of psychological aspects [33]. The findings of the 6497 Nordic study performed in 2002 also supported that female patients with psoriasis had higher DLQI scores than male patients [34]. However, in terms of treatment, female patients showed better improvements in PASI and DLQI scores than male patients, which might be due to the better medication adherence in females, and the lower BMI would facilitate the administration of higher dosages per kilogram in human tissue, which might also contribute to the better improvements in female patients [35].

The findings of this study indicate that BMI is closely linked to dermatology-related quality of life among patients with psoriasis. Logistic regression analysis revealed that overweight and obesity had 1.42 times and 1.54 times of higher probability of having a DLQI score >10, respectively, than patients with lower body weight. Evidence suggests that a higher BMI increases the risk of psoriasis severity, and an approximately 1 kg/m^2 increase in BMI was associated with a 4% increase in the OR of having severe psoriasis [36]. Obesity aggravated the existing psoriasis, and weight loss might improve the severity of psoriasis and improve the quality of life in overweight patients [37]. Previous studies have demonstrated that obesity and psoriasis-related skin inflammation might be linked by a number of pathways, including the release of pro-inflammatory cytokines and hormones by extra-skin adipose tissue. Tumour necrosis factor alpha and interleukin 6 are two cytokines that are specifically linked to the pathogenesis of psoriasis [38,39].

A key strength of this study was the large population size of patients with psoriasis. We sampled 4230 patients from 200 hospitals, which accounted for approximately 2% of all 12, 436 tertiary hospitals and secondary hospitals in China, so the findings could be generalized to all psoriasis patients in China. Moreover, the clinical data of patients with psoriasis were extracted from the Health Information System (HIS) directly without recall bias, which ensued the high data quality, is another strength of this study.

This study had some limitations. First, quality of life was assessed based on the DLQI questionnaire, which was self-administered to patients with psoriasis. Self-reported responses might lead to some information bias; item 9 (Q9, sexual difficulties) in the DLQI could be a puzzle for patients without sex experience, which could lead to the underestimation of the influence of psoriasis to some degree. Second, only the DLQI scale was assessed for quality of life in this study, and the Short-Form-36 (SF-36), Euro QOL 5-Dimensional Questionnaire for Psoriasis (EQ-5D-5L-PSO), Dermatology Quality of Life Scale (DQOLS) and Visual Analogue Scale (VAS) could be incorporated in future study. Third, the nature of the cross-sectional study design only allows the calculation of prevalence for DLQI score > 10 and to explore the correlation between life quality based on DLQI and psoriasis severity based on PASI, but it was not possible to estimate the different types of changes with treatment in a prospective view. All these limitations would restrict the interpretation of clinical findings to some degree.

Conclusions

The quality of life based on DLQI evaluation was positively correlated with disease severity among patients with psoriasis, especially among male patients and those with higher BMI. Therefore, we recommend that clinicians treat the DLQI as an important indicator in the management and treatment of patients with psoriasis.

Acknowledgements

We would like to thank the National Clinical Research Center for Skin and Immune Diseases (NCRCSID) for data collection.

Author contributions

R.P.W. and B.L. designed the study. Y.R.C., L.W., Y.S. and R.Z. collected data. L.K. and R.P.W. performed statistical analyses. Y.R.C. and L.W. drafted the manuscript; Y.S. and B.L. supervised the study; and R.P.W. revised the manuscript.

Ethical approval

This study was approved by the Institutional Review Boards of Peking University First Hospital, Beijing, China (2020-255) and Shanghai Skin Diseases Hospital, Shanghai, China (2021-27).

Consent form

Informed consent was obtained before starting the study, and the study was strictly performed in accordance with the guidelines of the STROBE statement and the Declaration of Helsinki.

Disclosure statement

The authors declare that they have no competing interests.

Funding

This study was supported by the National Key Research and Development Program of China (No. 2018YFC1705301), and the NSFC of China (Nos. 81973860, 81874470, 82074427 and 81904214), Clinical Trial Program of Shanghai Municipal Bureau of Health (202240371), Shanghai Shenkang Second Round Three Year Action Plan for Clinical Trial Program (SHDC2022CRS053), Hospital Management Program of Shanghai Hospital Association (X2022117), Intelligence Fund of Shanghai Skin Diseases Hospital (2021KYQD01), China Fund for Medical Equipment (LCIIT2022-03), China YMIOO Program (LCIIT2022-09), and Intelligence Funds of Shanghai Skin Disease Hospital (2021KYQD01), Shanghai Talent Development Fund (2021073), and Shanghai Shenkang Hospital Development Center Management Research Program (2020SKMR-32), Shanghai Sailing Program (No. 21YF1448100), and Xinglin Youth Scholar of Shanghai University of Traditional Chinese Medicine (No. RY411.33.10), Songjiang Science and Technology Program (20SJKJGG20, QQ Zhu) and Shanghai Pujiang Talent Program (No. 2020PJD067).

Data availability statement

The data for this study are available upon request from the corresponding author. The request should state the title and aim of the research for which the data are requested.

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