Research Article

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Journal of **Comparative Effectiveness Research**

Assessing the change in disease severity based on depressive symptoms in real-world psoriasis patients

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Aim: To evaluate whether the presence of a history of depression hinders psoriasis response to systemic therapies and to delineate baseline characteristics of patients whose depressive symptoms improved on systemic treatment. **Methods:** We studied patients within the Corrona® Psoriasis Registry, a prospective, multicenter observational disease-based registry, that were enrolled through September 2018, comparing changes from enrollment to 12-month visit. **Results:** There was a statistically significant improvement in all disease characteristics and most patient-reported outcomes in patients reporting a history of depression and in those that did not while there was no statistically significant difference in the degree of change comparing these two cohorts. Patients who noted improvement in depressive symptoms had more severe baseline disease characteristics and reported overall worse baseline patient-reported outcomes. **Conclusions:** History of depression does not portend a differential response to systemic treatment. Patients with improvement in depressive symptoms had worse baseline characteristics.

First draft submitted: 29 April 2021; Accepted for publication: 9 August 2021; Published online: 29 September 2021

Keywords: biologics • depression • disease severity • nonbiologic systemics • patient-reported outcomes • psoriasis

Background

Psoriasis is a common inflammatory skin disease impacting 3–4% of the adult population [1]. Although skin involvement is the most prominent and well-recognized manifestation of this disease, other associated comorbidities make it imperative to treat psoriasis as a multisystem inflammatory disorder in order to optimize management [2]. Depression is an established comorbidity of psoriasis [3] and is found to have a prevalence of >60% in cross-sectional studies [4,5].

Depression has a significant impact on quality of life, and there is also evidence to suggest that it may exacerbate psoriasis symptoms [6]. Several studies have shown improvement in depressive symptoms in parallel with improvement in disease characteristics in patients on systemic therapies [7–10]. One retrospective study suggested that depression at baseline can hinder clinical response to etanercept [11]. Ultimately, real-world data is necessary to better understand the implications of baseline depression on therapeutic response to systemic agents.

Our first aim was to investigate the changes in patient-reported outcomes (PROs) and psoriatic disease severity after receiving 12 months of systemic therapy for psoriasis, with respect to depression, to better delineate whether a history of depression portends a worse response to systemic treatment. Our second aim was to understand differences in baseline characteristics of patients who reported improvement in depressive symptoms versus those whose depressive symptoms did not improve while on systemic treatment.

Future Medicine

Methods

Study population

The Corrona Psoriasis Registry is a prospective, multicenter, observational disease-based registry that was launched in April 2015 in partnership with the National Psoriasis Foundation. Enrollment in the registry requires the following criteria to be met: established diagnosis of psoriasis per patient's dermatologist, age ≥18 years and initiation or switch to an eligible medication at enrollment or within the 12 months prior to the date of enrollment. Eligible medications include US FDA-approved biologic treatments for psoriasis (TNF inhibitors: adalimumab, etanercept, infliximab; IL-12/23 inhibitors: ustekinumab; IL-23 inhibitors: guselkumab, tildrakizumab, risankizumab; IL-17 inhibitors: secukinumab, ixekizumab, brodalumab) and nonbiologic systemic agents (methotrexate, cyclosporine, apremilast). Approximately every 6 months, follow-up data is collected on all enrolled patients in the form of patient and dermatologist questionnaires completed during routine dermatologic visits. The current study includes data collected through 10 September 2018. Among the 2574 patients enrolled during that timeframe, 706 (28%) had both an enrollment visit (considered as baseline for this analysis) and a 12-month follow-up visit and were included in the analysis. A 12-month visit was defined as 5–9 months from a 6-month visit (which is 5–9 months from the actual start date of the systemic medicine) or 9–15 months from the actual start date of the systemic medicine if no 6-month visit is available.

Variables

For the first aim, patients were stratified in accordance with the presence or absence of a history of depression (yes/no categorization). All depression information included in this study was patient-reported, which has been deemed satisfactory in previous studies [12,13].

Disease activity was measured using Psoriasis Area and Severity Index (PASI) [14], body surface area (BSA) and investigator global assessment (IGA) [15]. PROs evaluated included the Dermatology Life Quality Index [16] (DLQI; 0–30), work productivity and activity impairment (WPAI) [17] as well as skin pain, fatigue and itch scored on a visual analog scale of 0–100, with higher scores indicating worse status. These measures have been previously described as cited.

For the second aim, patients included needed to have baseline presence of depression as ascertained by the EQ-5D-3L anxiety/depression questionnaire [18]: extremely anxious/depressed, moderately anxious/depressed or not anxious/depressed. Improvement in depressive symptoms was established using EQ-5D-3L from baseline to 12-month follow-up and was defined as: movement from extreme to moderate or not anxious/depressed, or from moderate to not anxious/depressed.

Statistical analysis

Change in characteristics in patients with & without a history of depression

We compared the changes in disease characteristics and PROMs from baseline to 12-month visit between patients with and without a history of depression. Analyses were further stratified by gender. For disease characteristics and PROs, we tested whether the baseline-to-12 month change differed between those with and without a history of depression. We used the two-sample t-test to compare the mean change between the two groups, limited to those with 12-month visits available.

Describing patients whose depressive symptoms did & did not improve

Among the 706 individuals with 12-month follow-up information, 35 had missing values in magnitude of depression; therefore, sample size was reduced to 671. Among 671 patients with evidence of baseline presence of depression per EQ-5D-3L anxiety/depression questionnaire, only 86 reported improvement in depressive symptoms. Means and frequencies were used to describe characteristics of the two groups.

Results

Disease characteristics from baseline to 12-month visit

In accordance with our previous study [19], when stratified with respect to a history of depression, patients were more likely to be female (65.7%), white (88.4%), have a higher BMI (32.5), work part-time (12.8%) or be disabled (16.3%; Table 1). We evaluated the baseline disease characteristics of patients who reported a history of depression and compared it to 12 months. The same was performed for those without a history of depression. Mean BSA, PASI and IGA scores improved from baseline in both cohorts. Subsequently, the mean change in characteristics

Table 1. Baseline demographics among patients with and without patient-reported history of depression.

Variables	Patient-reported depression	
	No	Yes
	(n = 534)	(n = 172)
Age in years, mean (SD)	50.2 (14.5)	49.5 (14.0)
Sex, n (%)	n = 534	n = 172
– Male	303 (56.7%)	59 (34.3%)
– Female	231 (43.3%)	113 (65.7%)
Race, n (%)	n = 534	n = 172
– White	419 (78.5%)	152 (88.4%)
– Black	28 (5.2%)	6 (3.5%)
– Asian	60 (11.2%)	2 (1.2%)
– Other	27 (5.1%)	12 (7.0%)
BMI (kg/m^2), mean (SD)	30.6 (7.2)	32.5 (8.3)
Insurance type, n (%)		
– Private	437 (81.8%)	120 (69.8%)
– Medicare	80 (15.0%)	27 (15.7%)
– Medicaid	33 (6.2%)	33 (19.2%)
– No insurance	14 (2.6%)	8 (4.7%)
Education, n (%)	n = 533	n = 172
– 12th grade or less	34 (6.4%)	14 (8.1%)
– High school graduate/GED	122 (22.8%)	43 (25.0%)
– Some college/assoc. degree	153 (28.7%)	51 (29.7%)
– College graduate or higher	224 (41.9%)	64 (37.2%)
Marital status, n (%)	n = 532	n = 172
– Single	134 (25.1%)	55 (32.0%)
– Married	325 (60.9%)	84 (48.8%)
– Partnered	5 (0.9%)	3 (1.7%)
– Other	68 (12.7%)	30 (17.4%)
Work status, n (%)	n = 534	n = 172
– Full time	340 (63.7%)	83 (48.3%)
– Part time	44 (8.2%)	22 (12.8%)
– Work at home	28 (5.2%)	13 (7.6%)
– Student	12 (2.2%)	3 (1.7%)
– Disabled	25 (4.7%)	28 (16.3%)
– Retired	85 (15.9%)	23 (13.4%)
Smoking, n (%)	n = 529	n = 172
– Current smoker	84 (15.7%)	40 (23.3%)
– Past smoker	181 (33.9%)	58 (33.7%)
– Never smoked	264 (49.4%)	74 (43.0%)
History of comorbidities, n (%)	n = 705	n = 705
– Cardiovascular disease	42 (7.9%)	28 (16.3%)
– Hypertension	196 (36.8%)	75 (43.6%)
– Hyperlipidemia	139 (26.1%)	60 (34.9%)
– Diabetes mellitus	64 (12.0%)	36 (20.9%)
– Lymphoma	1 (0.2%)	0 (0.0%)
– Metabolic syndrome	5 (0.9%)	4 (2.3%)
– Crohn's disease	5 (0.9%)	1 (0.6%)

BMI: Body mass index (calculated as weight in kilograms divided by height in meters squared); GED: General education diploma; SD: Standard deviation.

Table 2. Mean (standard deviation) disease characteristics and patient-reported outcomes at baseline and 12-month visit for patients with and without patient-reported history of depression at baseline.

Variables	No history of depression		History of depression		p-value[†]
	Baseline	12 m follow-up	Baseline	12 m follow-up	
All patients	n = 532		n = 168		
– BSA	16.4 (17.5)	4.9 (9.4)	17.5 (19.6)	7.0 (14.1)	0.48
– PASI	9.4 (8.2)	3.0 (4.4)	8.8 (7.5)	3.7 (5.8)	0.06
– IGA	2.9 (0.9)	1.5 (1.3)	3.0 (0.8)	1.6 (1.3)	0.89
– Overall fatigue (0–100)	33.4 (29.2)	24.7 (26.9)	50.9 (29.3)	40.5 (31.6)	0.514
– Overall itch (0–100)	52.7 (34.2)	25.8 (31.0)	63.1 (33.9)	31.0 (33.4)	0.134
– Overall pain (0–100)	35.0 (32.7)	14.5 (23.4)	45.5 (35.9)	22.7 (30.6)	0.467
– DLQI (0–30)	8.2 (5.9)	3.6 (4.8)	11.0 (6.9)	5.2 (6.4)	0.08
– Currently employed, n (%)	377 (70.9%)	371 (69.7%)	104 (61.9%)	93 (55.4%)	NA
– Percent of work hours missed due to psoriasis	3.5 (12.1)	2.4 (11.4)	6.5 (17.0)	1.1 (3.8)	0.545
– Percent of impairment while working due to psoriasis	16.4 (23.5)	7.1 (15.2)	21.2 (27.5)	8.9 (18.0)	0.198
– Overall percent of work hours affected by psoriasis	18.1 (25.0)	8.0 (16.7)	24.4 (28.7)	9.8 (18.5)	0.23
– Percent of daily activities impaired by psoriasis	21.9 (27.1)	10.8 (20.5)	36.9 (32.8)	19.0 (28.6)	0.006
Men	n = 302		n = 57		
– BSA	17.8 (19.3)	4.8 (8.0)	15.8 (16.8)	8.1 (16.5)	0.04
– PASI	10.3 (8.9)	3.1 (4.7)	8.8 (6.3)	4.8 (7.1)	<0.01
– IGA	3.0 (0.9)	1.5 (1.3)	2.9 (0.8)	1.7 (1.5)	0.25
– Overall fatigue (0–100)	31.0 (29.4)	21.6 (24.6)	49.9 (26.9)	36.4 (29.0)	0.355
– Overall itch (0–100)	47.5 (34.5)	23.5 (29.9)	60.4 (34.2)	28.3 (31.9)	0.153
– Overall pain (0–100)	31.3 (32.3)	13.2 (22.3)	42.3 (36.4)	26.1 (32.5)	0.698
– DLQI (0–30)	7.4 (6.0)	3.2 (4.6)	10.2 (7.4)	5.7 (7.4)	0.839
– Currently employed, n (%)	229 (75.8%)	225 (74.5%)	38 (66.7%)	34 (59.6%)	NA
– Percent of work hours missed due to psoriasis	3.3 (13.4)	2.2 (11.6)	6.2 (17.8)	0.5 (1.7)	0.772
– Percent of impairment while working due to psoriasis	15.5 (23.0)	6.5 (15.5)	16.9 (26.1)	9.5 (20.1)	0.815
– Overall percent of work hours affected by psoriasis	16.7 (24.5)	7.2 (16.7)	21.3 (27.7)	9.9 (20.3)	0.784
– Percent of daily activities impaired by psoriasis	20.4 (26.4)	9.8 (20.2)	33.5 (31.0)	19.6 (30.0)	0.445
Women	n = 230		n = 111		
– BSA	14.6 (14.8)	5.0 (11.0)	13.3 (20.9)	6.5 (12.8)	0.21
– PASI	8.1 (6.9)	2.7 (4.0)	8.8 (8.1)	3.1 (5.0)	0.67
– IGA	2.9 (0.8)	1.6 (1.2)	3.0 (0.8)	1.5 (1.2)	0.39
– Overall fatigue (0–100)	36.5 (28.8)	28.9 (29.1)	51.5 (30.6)	42.7 (32.8)	0.728
– Overall itch (0–100)	59.5 (32.8)	28.9 (32.1)	64.5 (33.8)	32.3 (34.2)	0.736
– Overall pain (0–100)	39.9 (32.8)	16.3 (24.8)	47.1 (35.8)	21.0 (29.5)	0.536
– DLQI (0–30)	9.3 (5.6)	4.1 (5.0)	11.4 (6.6)	4.9 (5.8)	0.143
– Currently employed, n (%)	148 (64.3%)	146 (63.5%)	66 (59.5%)	59 (53.2%)	NA
– Percent of work hours missed due to psoriasis	3.8 (9.7)	2.7 (11.3)	6.8 (16.4)	1.5 (4.6)	0.235
– Percent of impairment while working due to psoriasis	17.8 (24.3)	8.0 (14.7)	24.0 (28.3)	8.5 (16.8)	0.062
– Overall percent of work hours affected by psoriasis	20.4 (25.7)	9.4 (16.9)	26.5 (29.4)	9.8 (17.6)	0.082
– Percent of daily activities impaired by psoriasis	23.8 (28.1)	12.1 (20.8)	38.7 (33.7)	18.7 (28.0)	0.016

[†]p-value for two-sample t-test comparing the difference in mean change (baseline to 12 m) between those with and without history of depression; a statistically significant result indicates that the change in the PRO from baseline to follow-up for those with a history of depression differs from the change among those without a history of depression.
BSA: Body surface area; DLQI: Dermatology Life Quality Index; IGA: Investigator global assessment; PASI: Psoriasis Area and Severity Index; PRO: Patient-reported outcome.

from baseline to 12 months was compared between the two cohorts. There was no statistically significant difference observed for BSA, PASI, and IGA.

When stratified by gender and the same analysis performed, men without a history of depression had greater improvements in BSA and PASI (13 vs 7.7%, p-value = 0.04; 7.2 vs 4, p-value <0.01, respectively; Table 2).

Evaluation of women revealed congruous trends as the overall cohort analysis, revealing no statistically significant difference in the mean changes between the two groups (Table 2).

PROs from baseline to 12-month visit

Analysis of PROs revealed improvement in both patients reporting and not reporting a history of depression from enrollment to 12-month follow-up for overall fatigue, itch, pain and DLQI (Table 2). There was no statistically significant difference in the degree of mean change from baseline to the 12-month visit when comparing those without a history of depression and those with a history. At the 12-month visit, individuals from both cohorts showed improvement in all WPAI domains (Table 2).

For almost all parameters, PRO results in men were congruous with the overall population (Table 2). Similarly, among women, the differences in PRO between those who reported depression and those who did not were similar to the overall cohort analysis (Table 2).

Baseline characteristics of those with improved depressive symptoms versus no improvement

Of the 671 patients with baseline presence of depression per the EQ-5D-3L tool, 585 (87.2%) did not improve in their depressive symptoms at their 12-month follow-up while 86 (12.8%) improved. Patients whose depressive symptoms improved were more likely to be White (87.2%), not married (51%), female (52.3%) and obese (53.5%) (Table 3). They were also more likely to have hypertension and hyperlipidemia. In the improved cohort, there was a greater proportion of disabled (15.1%), retired individuals (23.3%) and those who are current (25.6%) or past smokers (37.2%). Further analysis revealed 13.4% of the no improvement group reported antidepressant use while 29.1% of the improvement cohort was on antidepressants.

Overall, baseline disease characteristics were worse in the improved depression population as compared to the no improvement in depression cohort at baseline (Table 4). This held true for mean BSA (15.6 vs 22.8%, respectively), mean PASI (8.7 vs 11.5, respectively) and mean IGA (2.9 vs 3.1, respectively). A greater proportion of the improved cohort had psoriatic arthritis as compared with the no improvement cohort (54.7 vs 36.4%).

Similar to baseline disease characteristics, comparing baseline PROs revealed worse baseline characteristics in the group that improved at 12 months (Table 4). WPAI analysis of the two cohorts at baseline revealed the proportion of patients that were employed was higher in the no improvement cohort (70.3% vs 54.7%). Of those whose depressive symptoms did not improve at 12 months, at baseline they reported fewer work hours missed, less impairment while working due to psoriasis, fewer work hours affected by psoriasis and less impairment of daily activities. At baseline, mean DLQI was worse in the improved cohort – 12.7 versus 8.2.

Discussion

Our data show that among patients with psoriasis being treated with systemic therapies in the Corrona Psoriasis Registry, there was a statistically significant improvement in all physical disease characteristics (i.e., BSA, PASI and IGA) and most PROs (fatigue, itch and pain) at 12 month follow-up in all patients regardless of their depression history. This was consistent for men and women. For most variables, the magnitude of change was similar between the depression and no depression cohorts. One exception was men without depression experienced a statistically significant greater improvement in BSA and PASI as compared to men with depression.

With respect to our second aim, patients whose depressive symptoms improved at the 12-month follow-up were more likely at baseline to be older, female, White, not married, unemployed, obese or overweight, current or past smokers, on federal insurance and have hypertension and hyperlipidemia compared to those whose symptoms did not improve. Interestingly, those whose depressive symptoms improved had more severe skin disease and worse PROs at baseline.

Our findings overall suggest that a history of depression does not portend a differential response to systemic treatment. These findings contrast with the study by Jin *et al.* that found depressive symptoms predict worse clinical response to etanercept treatment in psoriasis patients [11]. Our data indicate that after 12 months of systemic treatment, the cutaneous burden of psoriatic disease (BSA, PASI, and IGA scores), PROs and DLQI improved regardless of the patient's depression history. For most variables, the degree of improvement did not statistically differ between those with and without a history of depression, suggesting depressive symptoms does not predict worse clinical response to systemic treatments, including biologics. However, to account for the differences observed between our cohort and Jin *et al.*, we must also consider that our patients may be taking one of several systemic medications and they may have switched or discontinued therapy over the follow-up period, which was

Table 3. Baseline demographics of patients whose depressive symptoms did and did not improve from baseline to 12-month visit.

Demographics at baseline	Depressive symptoms	
	Did not improve	Improved
	(n = 585)	(n = 86)
Age in years, mean (SD)	49.7 (14.5)	53.1 (13.9)
Sex, n (%)	n = 585	n = 86
– Male	304 (52.0%)	41 (47.7%)
– Female	281 (48.0%)	45 (52.3%)
Race, n (%)	n = 585	n = 86
– White	470 (80.3%)	75 (87.2%)
– Black	30 (5.1%)	2 (2.3%)
– Asian	53 (9.1%)	5 (5.8%)
– Other	32 (5.5%)	4 (4.7%)
BMI (kg/m^2), mean (SD)	30.9 (7.5)	32.6 (7.5)
Insurance type, n (%)		
– Private	473 (80.9%)	58 (67.4%)
– Medicare	85 (14.5%)	20 (23.3%)
– Medicaid	51 (8.7%)	12 (14.0%)
– No insurance	14 (2.4%)	4 (4.7%)
Education, n (%)		
– 12th grade or less	37 (6.3%)	8 (9.3%)
– High school graduate/GED	134 (22.9%)	21 (24.4%)
– Some college/Assoc. degree	160 (27.4%)	35 (40.7%)
– College graduate or higher	254 (43.4%)	21 (24.4%)
Marital status, n (%)		
– Single	148 (25.3%)	31 (36.0%)
– Married	349 (59.7%)	42 (48.8%)
– Partnered	6 (1.0%)	1 (1.2%)
– Other	80 (13.7%)	12 (14.0%)
Work status, n (%)		
– Full time	361 (61.7%)	41 (47.7%)
– Part time	53 (9.1%)	6 (7.0%)
– Work at home	33 (5.6%)	5 (5.8%)
– Student	14 (2.4%)	1 (1.2%)
– Disabled	39 (6.7%)	13 (15.1%)
– Retired	85 (14.5%)	20 (23.3%)
Smoking, n (%)		
– Current smoker	96 (16.4%)	22 (25.6%)
– Past smoker	191 (32.6%)	32 (37.2%)
– Never smoked	294 (50.3%)	32 (37.2%)
History of comorbidities, n (%)		
– CVD	58 (9.9%)	10 (11.6%)
– Hypertension	217 (37.2%)	44 (51.2%)
– Hyperlipidemia	157 (26.9%)	32 (37.2%)
– Diabetes mellitus	84 (14.4%)	13 (15.1%)
– Lymphoma	1 (0.2%)	0 (0.0%)
– Metabolic syndrome	6 (1.0%)	2 (2.3%)
– Crohn's disease	4 (0.7%)	2 (2.3%)
Currently taking antidepressant, n (%)		
– Yes	78 (13.4%)	25 (29.1%)

BMI: Body mass index (calculated as weight in kilograms divided by height in meters squared); CVD: Cardiovascular disease; GED: General education diploma; SD: Standard deviation.

Table 4. Baseline disease characteristics and patient-reported outcomes between patients whose depressive symptoms did and did not improve from baseline to the 12-month visit.

Disease characteristics at baseline	Depressive symptoms	
	Did not improve	Improved
	(n = 585)	(n = 86)
BSA (% involvement), mean (SD)	15.6 (17.4)	22.8 (20.4)
PASI (score: 0–72), mean (SD)	8.7 (7.5)	11.5 (9.9)
IGA, mean (SD)	2.9 (0.8)	3.1 (1.0)
Psoriasis duration (years), mean (SD)	15.7 (13.7)	17.3 (15.1)
Psoriatic arthritis, n (%)	213 (36.4%)	47 (54.7%)
Psoriatic arthritis duration (years), mean (SD)	7.4 (8.2)	8.3 (8.5)
Patient overall fatigue (VAS range: 0–100), mean (SD)	35.2 (29.5)	53.5 (30.2)
Patient overall itch (VAS range: 0–100), mean (SD)	53.5 (34.3)	64.0 (34.2)
Patient overall pain (VAS range: 0–100), mean (SD)	34.6 (33.1)	54.7 (34.5)
Currently employed, n (%)	411 (70.3%)	47 (54.7%)
Percent of work hours missed due to psoriasis, mean (SD)	3.9 (13.8)	7.4 (14.0)
Percent of impairment while working due to psoriasis, mean (SD)	15.2 (23.0)	31.1 (30.8)
Overall percent of work hours affected by psoriasis, mean (SD)	17.0 (24.6)	34.9 (30.7)
Percent of daily activities impaired by psoriasis, mean (SD)	22.2 (27.3)	45.8 (34.5)
DLQI (score: 0–30), mean (SD)	8.2 (6.0)	12.7 (6.8)

BSA: Body surface area; DLQI: Dermatology Life Quality Index; IGA: Investigator global assessment; PASI: Psoriasis Area and Severity Index; SD: Standard deviation; VAS: Visual analogue scale.

not an exclusionary factor in our cohort. Furthermore, in Jin *et al.*, depression was evaluated using Hospital and Anxiety Depression Scale with a study duration of 6 months which differs from our study parameters.

No study to date has evaluated baseline characteristics of depressed psoriasis patients with improvement in depression versus those without. In our cohort, of the 671 patients with depression, 585 (87.2%) did not improve in their depressive symptoms at their 12-month follow-up while 86 (12.8%) improved. Among those who reported improvement in depressive symptoms, we observed worse baseline disease characteristics and PROs in comparison to those that did not have improvement in depressive symptoms – a finding not previously reported. Assessing these findings requires exploration of the underlying pathophysiology of depression and psoriasis. Previous studies have postulated the role of the dysregulated cytokine network on the CNS yielding depression/anxiety [20,21]. Several studies have shown improvement in depressive symptoms with institution of systemic therapies [7,8], which may partially be explained by control of underlying systemic inflammation. Therefore, it is unclear if greater improvement in depressive symptoms in patients with worse disease characteristics is related to psychosocial factors – the noticeable stark improvement in physical disease, the underlying reduction in systemic inflammation, or the possibility that these patients may have been more depressed at baseline with worse scoring of subjective PROs due to more underlying pessimism.

The small percent (~13%) of patients in our cohort that showed improvement in depressive symptoms contrasts with the literature. Previous studies have shown significant improvement in depressive symptoms following biologic therapy, including 40% reduction in antidepressant use in biologic users with psoriasis after 2 years [22]. We postulate that 12 months may not be sufficient time to observe the effects of biologic therapy on depressive symptoms in psoriasis patients.

Strengths & limitations

To our knowledge, this is the first real-world study of psoriasis patients comparing the degree of improvement in disease characteristics in those with a history of depression as compared with those without a history. Further, this is the first study to compare the characteristics of patients with improvement in depression versus those without improvement. Limitations of this study include data attainment from only USA and Canada. Participation in the registry is voluntary so the sample may not fully represent the entire psoriasis population. Only 30% of patients enrolled in the registry had a 12-month follow-up visit when the data were analyzed, which may introduce bias in

estimates. Our patient cohort consisted of a mix of biologic and nonbiologic patients with no stratification based on therapeutic modality.

Conclusion

Our real-world study suggests that among patients with psoriasis, a history of depression does not portend a differential response to systemic treatment. Further, those with improvements in depressive symptoms have worse disease characteristics and PROs at baseline. Further elucidation of the relationship between psoriasis and depression would be highly informative.

Summary points

- Psoriasis is a multisystem inflammatory disease involving organs beyond the skin.
- A full understanding of psoriasis and its comorbidities are crucial for informing appropriate management strategies.
- The relationship between psoriasis and depression has not been fully elucidated.
- Although depression and psoriasis are interrelated, it is unclear whether depression influences response to systemic therapies.
- Data from the Corrona Psoriasis Registry show that the presence or absence of a history of depression does not portend a differential response to systemic treatment.
- It is unclear why some patients with psoriasis and depression have improvement in their depressive symptoms while others do not.
- Data from the Corrona Psoriasis Registry show that psoriasis patients with improvement in their depressive symptoms had worse baseline disease characteristics and patient-reported outcomes at enrollment.
- This study is subject to limitations including selection bias and data based on 12-month follow-up. However, continued data collection and analysis can inform us regarding this important topic.

Author contributions

Access to study data was limited to Corrona and Corrona statisticians completed all of the analysis; all authors contributed to the interpretation of the results. All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by T-C Lin, HJ Litman, R McLean and B Dube. The first draft of the manuscript was written by N Shahriari, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Acknowledgments

The authors thank the participating providers and patients for contributing data to the Corrona Psoriasis Registry. This study was supported through a partnership between the Corrona Psoriasis Registry and the National Psoriasis Foundation Medical Board.

Financial & competing interests disclosure

This study was sponsored by Corrona, LLC, and the analysis was funded by Corrona LLC. Corrona Psoriasis Registry is sponsored by Corrona, LLC and is funded by AbbVie, Boehringer Ingelheim, Eli Lilly and Company, Janssen, Novartis Pharmaceuticals Corporation and Valeant. T Lin, RR McLean and B Dube are employees of Corrona, LLC. HJ Litman is an employee and shareholder of Corrona. M Shahriari receives honoraria as a consultant for AbbVie, Janssen, LEO Pharma, Novartis, Ortho Dermatologics and Regeneron; is a speaker for AbbVie, Lilly and Janssen; and is an investigator for AbbVie, the Corrona Psoriasis Registry, Dermira, Cara, Dermavant and Novartis. N Shahriari is sub-investigator for the Corrona Registry at her site. The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

No writing assistance was utilized in the production of this manuscript.

Ethical conduct of research

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. All sites providing data to the Corrona Psoriasis Registry obtain IRB approval. Informed consent was obtained from all individual participants included in the study. The authors affirm that human research participants provided informed consent for publication of data.

Data sharing statement

All data generated or analyzed during this study are included in this published article.

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