Characterization of Patients with Psoriasis in Challenging-to-Treat Body Areas in the Corrona Psoriasis Registry

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Keywords

Psoriasis · Quality of life · Real-world evidence · Registry

Abstract

Background: Real-world studies evaluating patients with challenging-to-treat localizations of psoriasis (scalp, nail, and palmoplantar) are limited. **Objective:** To characterize patients with versus without psoriasis in challenging-to-treat areas seen in routine US clinical practice. **Methods:** This retrospective observational study included all adult patients with psoriasis enrolled in the Corrona Psoriasis Registry between April 2015 and May 2018 who initiated a biologic therapy at registry enrollment. Patients were stratified by the presence of scalp, nail, or palmoplantar psoriasis (nonmutually exclusive groups). Patient demographics, clinical characteristics, disease activity, and patient-reported outcome measures (pain, fatigue, itch, EuroQol visual analog scale [EQ VAS], Dermatology Life Quality Index [DLQI], and Work Productivity and Activity Impairment questionnaire [WPAI]) were assessed at registry enrollment and compared between patients with versus without each challenging-to-treat area using nonparametric Kruskal-Wallis tests for con-

tinuous variables and χ^2 or Fisher exact tests for categorical variables. Generalized linear regression models were used to estimate differences in disease activity and patient-reported outcomes between patients with versus without each challenging-to-treat area. **Results:** Among 2,042 patients with psoriasis (mean age [$\pm$ SD], 49.6 $\pm$ 14.7 years; 51.5% male), 38.4% had psoriatic arthritis (PsA), 38.1% had scalp psoriasis, 16.0% had nail psoriasis, 10.9% had palmoplantar psoriasis, and 26.2% had a combination of ≥ 2 challenging-to-treat areas and PsA; only 34.2% had body plaque psoriasis without PsA or challenging-to-treat areas. Patients in all challenging-to-treat groups reported higher (mean [95% CI]) itch (scalp, 58.01 [57.62–58.40] vs. 54.35 [53.99–54.72]; nail, 56.42 [56.02–56.81] vs. 55.59 [55.20–55.97]; palmoplantar, 60.22 [59.86–60.59] vs. 55.15 [54.79–55.54]) and lower EQ VAS (scalp, 68.12 [67.78–68.48] vs. 69.46 [69.12–69.81]; nail, 66.21 [65.89–66.55] vs. 69.48 [69.14–69.83]; palmoplantar, 66.21 [66.07–66.75] vs. 69.29 [68.94–69.94]) scores than those without the respective challenging-to-treat localization. Patients with nail or palmoplantar psoriasis reported higher pain, fatigue, and DLQI scores than those without. Higher proportions of patients with scalp or palmoplantar psoriasis reported work impairment compared with those without.

Conclusion: Two-thirds of patients with psoriasis who initiated biologic therapy had PsA and/or ≥ 1 challenging-to-treat area. Patients with challenging-to-treat areas had worse patient-reported outcome scores than those without, indicating a significant burden of challenging-to-treat areas on patients' quality of life.

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Introduction

Psoriasis is a chronic, immune-mediated, inflammatory skin disease that affects approximately 7.4 million adults (2–4%) in the USA [1, 2]. Patients with psoriasis can experience substantial physical, psychosocial, and economic burdens that decrease their quality of life (QOL) [3–6]. Patients with psoriasis also have a higher risk of numerous comorbidities – such as cardiovascular disease, metabolic syndrome, depression, anxiety, and renal, hepatic, and respiratory comorbidities – than the general population, which can complicate disease management [7–12]. Additionally, up to 30% of patients with psoriasis may develop psoriatic arthritis (PsA), which can lead to joint damage and disability [1, 13, 14]. The goal of treatment in patients with psoriasis is to clear the skin and improve QOL [15]. Currently available therapies include topical agents, targeted and systemic phototherapy, and systemic agents such as methotrexate; for patients with moderate to severe psoriasis, biologics are recommended [15].

The primary manifestation of psoriasis is inflammation of the skin characterized by scaling, erythematous plaques; other clinical manifestations include inverse, erythrodermic, pustular, and nail disease [1, 16]. Psoriasis localized to certain areas of the body, such as scalp, nail, and palmoplantar, is challenging to treat (CTT) and is often associated with substantial physical discomfort and disability [17, 18]. Patients with scalp psoriasis have reported greater disease and itch severity and poorer health than those with psoriasis localized to other areas [19]. Nail psoriasis can lead to substantial functional impairment in manual dexterity as well as pain, discomfort, and psychological stress, resulting in decreased QOL and work productivity [20–23]. Palmoplantar disease is characterized by lesions on the palms and soles, which can be painful and disabling [24]. Patients with palmoplantar psoriasis have reported worse health-related QOL than those without [25]. The locations and morphological features of scalp, nail, and palmoplantar psoriasis can inhibit effective treatment with topical therapies [26–28].

Due to barriers that limit effective treatment of psoriasis in CTT areas with localized topical therapy, management of CTT localizations often requires systemic treatments [29, 30]. However, not all systemic treatments address psoriasis in CTT body areas equally, and there is a lack of agreement on the best therapeutic modalities to use for the management of psoriasis in such areas. Understanding the characteristics of patients with CTT localizations of psoriasis – including demographics, clinical characteristics, disease activity, and patient-reported outcomes – can provide a better understanding of the treatment needs of these patients.

Real-world studies evaluating patients with CTT localizations of psoriasis are limited. The objectives of this study were to estimate the prevalence of PsA and nail, scalp, and palmoplantar psoriasis separately and in combination among US patients with psoriasis and to characterize patients with CTT localizations of psoriasis compared with those without CTT localizations using data from the Corrona Psoriasis Registry.

Patients and Methods

For further details, see the online Supplementary Material (see www.karger.com/doi/10.1159/000504841 for all online suppl. material) [9, 31–34] (Fig. 1).

Results

Prevalence of CTT Areas and PsA

A total of 2,042 patients with psoriasis initiated biologic therapy at registry enrollment and were included in the analysis. Overall, 784 (38.4%) had PsA, 778 (38.1%) had scalp psoriasis, 326 (16.0%) had nail psoriasis, and 223 (10.9%) had palmoplantar psoriasis (Fig. 2). When examining the prevalence of mutually exclusive PsA and CTT areas, 427 patients (20.9%) had PsA alone, 297 (14.5%) had scalp psoriasis only, 26 (1.3%) had nail psoriasis only, and 58 (2.8%) had palmoplantar psoriasis only. A total of 535 (26.2%) patients had a combination of ≥ 2 CTT areas and/or PsA, 25 (1.2%) had psoriasis in all 3 CTT areas, and 40 (2.0%) had psoriasis in all 3 CTT areas + PsA. When examining the prevalence of mutually exclusive combinations of PsA and CTT areas, the most prevalent presentations were PsA + scalp psoriasis (7.1%), scalp + nail psoriasis (5.2%), and PsA + nail and scalp psoriasis (4.9%); all other combinations were present in <3% of patients.

Fig. 1. Flowchart of Patients and Methods. BSA, body surface area; CTT, challenging to treat; DLQI, Dermatology Life Quality Index; EQ VAS, EuroQol visual analog scale; IGA, Investigator's Global Assessment; PROs, patient-reported outcomes; US FDA, United States Food and Drug Administration; WPAI, Work Productivity and Activity Impairment.

Table 1. Demographics of patients with psoriasis at time of registry enrollment

Characteristic	All patients (n = 2,042)	Scalp psoriasis (n = 778)	No scalp psoriasis (n = 1,264)	Nail psoriasis (n = 326)	No nail psoriasis (n = 1,716)	Palmoplantar psoriasis (n = 223)	No palmoplantar psoriasis (n = 1,819)
Age, years	49.6±14.7	48.3±15.0 ^a	50.4±14.5	50.3±14.5	49.5±14.8	53.4±13.9 ^a	49.1±14.8
Male	1,052 (51.5)	385 (49.5)	667 (52.8)	193 (59.2) ^a	859 (50.1)	103 (46.2)	949 (52.2)
Race							
White	1,638 (80.2)	614 (78.9)	1,024 (81.0)	261 (80.0)	1,377 (80.2)	175 (78.5)	1,463 (80.4)
Asian	175 (8.6)	76 (9.8)	99 (7.8)	28 (8.6)	147 (8.6)	25 (11.2)	150 (8.2)
Black	88 (4.3)	27 (3.5)	61 (4.8)	10 (3.1)	78 (4.5)	9 (4.0)	79 (4.3)
Other	141 (6.9)	61 (7.8)	80 (6.3)	27 (8.3)	114 (6.6)	14 (6.3)	127 (7.0)
BMI, kg/m ²	n = 2,032	n = 774	n = 1,258	n = 324	n = 1,708	n = 223	n = 1,809
Mean ± SD	31.1±7.6	31.0±7.7	31.2±7.4	31.3±7.6	31.1±7.5	31.4±7.7	31.1±7.5
BMI classifications							
Normal/underweight (<25)	429 (21.1)	166 (21.4)	263 (20.9)	65 (20.1)	364 (21.3)	39 (17.5)	390 (21.6)
Overweight (25–<30)	576 (28.3)	218 (28.2)	358 (28.5)	94 (29.0)	482 (28.2)	73 (32.7)	503 (27.8)
Obese (≥30)	1,027 (50.5)	390 (50.4)	637 (50.6)	165 (50.9)	862 (50.5)	111 (49.8)	916 (50.6)
Smoking status	n = 2,018	n = 765	n = 1,253	n = 320	n = 1,698	n = 221	n = 1,797
Never smoked	1,000 (49.6)	408 (53.3) ^b	592 (47.2)	141 (44.1)	859 (50.6)	97 (43.9)	903 (50.3)
Former smoker	644 (31.9)	225 (29.4) ^b	419 (33.4)	111 (34.7)	533 (31.4)	74 (33.5)	570 (31.7)
Current smoker	374 (18.5)	132 (17.3) ^b	242 (19.3)	68 (21.3)	306 (18.0)	50 (22.6)	324 (18.0)
Education	n = 2,039	n = 776	n = 1,263	n = 325	n = 1,714	n = 223	n = 1,816
College or above	844 (41.4)	346 (44.6)	498 (39.4)	150 (46.2)	694 (40.5)	96 (43.0)	748 (41.2)
Insurance type							
Private	1,538 (75.3)	583 (74.9)	955 (75.6)	225 (69.0) ^a	1,313 (76.5)	176 (78.9)	1,362 (74.9)
Medicare	331 (16.2)	119 (15.3)	212 (16.8)	63 (19.3)	268 (15.6)	48 (21.5)	283 (15.6)
Medicaid	233 (11.4)	101 (13.0)	132 (10.4)	53 (16.3) ^a	180 (10.5)	24 (10.8)	209 (11.5)
None	75 (3.7)	30 (3.9)	45 (3.6)	15 (4.6)	60 (3.5)	5 (2.2)	70 (3.8)
Work status	n = 2,040	n = 777	n = 1,263	n = 326	n = 1,714	n = 223	n = 1,817
Full time	1,198 (58.7)	463 (59.6) ^b	735 (58.2)	189 (58.0)	1,009 (58.9)	116 (52.0) ^b	1,082 (59.5)
Part time	177 (8.7)	73 (9.4) ^b	104 (8.2)	30 (9.2)	147 (8.6)	25 (11.2) ^b	152 (8.4)
Work at home	139 (6.8)	53 (6.8) ^b	86 (6.8)	23 (7.1)	116 (6.8)	18 (8.1) ^b	121 (6.7)
Student	65 (3.2)	34 (4.4) ^b	31 (2.5)	6 (1.8)	59 (3.4)	3 (1.3) ^b	62 (3.4)
Disabled	153 (7.5)	48 (6.2) ^b	105 (8.3)	27 (8.3)	126 (7.4)	14 (6.3) ^b	139 (7.6)
Retired	308 (15.1)	106 (13.6) ^b	202 (16.0)	51 (15.6)	257 (15.0)	47 (21.1) ^b	261 (14.4)
Geographic region	n = 2,042	n = 778	n = 1,264	n = 326	n = 1,716	n = 223	n = 1,819
Northeast	677 (33.2)	287 (36.9) ^b	390 (30.9)	103 (31.6) ^b	574 (33.4)	96 (43.0) ^b	581 (31.9)
Midwest	268 (13.1)	62 (8.0) ^b	206 (16.3)	22 (6.7) ^b	246 (14.3)	28 (12.6) ^b	240 (13.2)
South	779 (38.1)	274 (35.2) ^b	505 (40.0)	112 (34.4) ^b	667 (38.9)	58 (26.0) ^b	721 (39.6)
West	277 (13.6)	128 (16.5) ^b	149 (11.8)	78 (23.9) ^b	199 (11.6)	30 (13.5) ^b	247 (13.6)

Data are presented as n (%) or mean ± SD as appropriate. BMI, body mass index. ^a $p < 0.05$ for the comparison between patients with vs. those without the condition. ^b $p < 0.05$ for the overall distribution across categories of patients with vs. those without the condition.

Only 699 patients (34.2%) had exclusively plaque-type psoriasis (i.e., absence of PsA and scalp, nail, or palmoplantar psoriasis).

Patient Demographics at Enrollment

The overall mean age (±SD) was 49.6 ± 14.7 years; 51.5% of patients were male, 80.2% were white, and 50.5% were obese (body mass index ≥30 kg/m²) (Table 1). Patients with scalp psoriasis were younger than those without (mean age, 48.3 ± 15.0 vs. 50.4 ± 14.5 years; $p = 0.002$), whereas those with palmoplantar psoriasis were older than those without (mean age, 53.4 ± 13.9 vs. 49.1 ± 14.8

years; $p < 0.001$). A higher proportion of patients with nail psoriasis were male (59.2 vs. 50.1%; $p = 0.003$) compared with those without.

Clinical Characteristics and Treatment History at Enrollment

The overall mean psoriasis disease duration was 14.9 ± 13.5 years, with significant differences observed between patients with and those without scalp psoriasis and between patients with and those without nail psoriasis. Patients with psoriasis in 1 CTT area were significantly more likely to have other CTT areas than those without

Table 2. Clinical characteristics and treatment history in patients with psoriasis at time of registry enrollment

Characteristic	All patients (n = 2,042)	Scalp psoriasis (n = 778)	No scalp psoriasis (n = 1,264)	Nail psoriasis (n = 326)	No nail psoriasis (n = 1,716)	Palmoplantar psoriasis (n = 223)	No palmoplantar psoriasis (n = 1,819)
Psoriasis disease duration, years	n = 2,033	n = 774	n = 1,259	n = 325	n = 1,708	n = 222	n = 1,811
Mean ± SD	14.9±13.5	15.7±13.1 ^a	14.3±13.7	18.2±13.6 ^a	14.2±13.3	13.5±13.6	15.0±13.4
History of psoriasis morphology							
Plaque	1,974 (96.7)	759 (97.6)	1,215 (96.1)	316 (96.9)	1,658 (96.6)	199 (89.2) ^a	1,775 (97.6)
Guttate	115 (5.6)	56 (7.2) ^a	59 (4.7)	27 (8.3) ^a	88 (5.1)	12 (5.4)	103 (5.7)
Erythrodermic	65 (3.2)	36 (4.6) ^a	29 (2.3)	18 (5.5) ^a	47 (2.7)	40 (17.9) ^a	25 (1.4)
Pustular	28 (1.4)	11 (1.4)	17 (1.3)	6 (1.8)	22 (1.3)	12 (5.4) ^a	16 (0.9)
Inverse/intertriginous	167 (8.2)	130 (16.7) ^a	37 (2.9)	71 (21.8) ^a	96 (5.6)	38 (17.0) ^a	129 (7.1)
Scalp	778 (38.1)	778 (100) ^a	0	273 (83.7) ^a	505 (29.4)	127 (57.0) ^a	651 (35.8)
Nail	326 (16.0)	273 (35.1) ^a	53 (4.2)	326 (100) ^a	0	76 (34.1) ^a	250 (13.7)
Palmoplantar	223 (10.9)	127 (16.3) ^a	96 (7.6)	76 (23.3) ^a	147 (8.6)	223 (100) ^a	0
History of comorbidities							
Hypertension	738 (36.1)	257 (33.0) ^a	481 (38.1)	121 (37.1)	617 (36.0)	96 (43.0) ^a	642 (35.3)
Hyperlipidemia	528 (25.9)	195 (25.1)	333 (26.3)	85 (26.1)	443 (25.8)	73 (32.7) ^a	455 (25.0)
Anxiety	423 (20.7)	160 (20.6)	263 (20.8)	79 (24.2) ^a	344 (20.0)	55 (24.7) ^a	368 (20.2)
Depression	409 (20.0)	159 (20.4)	250 (19.8)	86 (26.4)	323 (18.8)	56 (25.1)	353 (19.4)
Diabetes mellitus	296 (14.5)	108 (13.9)	188 (14.9)	43 (13.2)	253 (14.7)	28 (12.6)	268 (14.7)
Cardiovascular disease	62 (3.0)	23 (3.0)	39 (3.1)	15 (4.6)	47 (2.7)	5 (2.2)	57 (3.1)
Metabolic syndrome	24 (1.2)	15 (1.9)	9 (0.7)	7 (2.1)	17 (1.0)	4 (1.8)	20 (1.1)
Crohn disease	17 (0.8)	11 (1.4) ^a	6 (0.5)	4 (1.2)	13 (0.8)	5 (2.2) ^a	12 (0.7)
Lymphoma/malignancy	4 (0.2)	1 (0.1)	3 (0.2)	1 (0.3)	3 (0.2)	0	4 (0.2)
History of biologic use	1,149 (56.3)	458 (58.9) ^a	691 (54.7)	220 (67.5) ^a	929 (54.1)	131 (58.7)	1,018 (56.0)
Number of prior biologics							
1	530 (46.1)	194 (42.4) ^b	336 (48.6)	77 (35.0) ^b	453 (48.8)	56 (42.7)	474 (46.6)
2	328 (28.5)	125 (27.3) ^b	203 (29.4)	67 (30.5) ^b	261 (28.1)	35 (26.7)	293 (28.8)
≥3	291 (25.3)	139 (30.3) ^b	152 (22.0)	76 (34.5) ^b	215 (23.1)	40 (30.5)	251 (24.7)
History of nonbiologic use	1,034 (50.6)	394 (50.6)	640 (50.6)	193 (59.2) ^a	841 (49.0)	132 (59.2) ^a	902 (49.6)
Number of prior nonbiologics							
1	742 (71.8)	274 (69.5)	468 (73.1)	129 (66.8)	613 (72.9)	76 (57.6) ^b	666 (73.8)
2	218 (21.1)	89 (22.6)	129 (20.2)	45 (23.3)	173 (20.6)	38 (28.8) ^b	180 (20.0)
≥3	74 (7.2)	31 (7.9)	43 (6.7)	19 (9.8)	55 (6.5)	18 (13.6) ^b	56 (6.2)

Data are presented as *n* (%) or mean ± SD as appropriate. ^a *p* < 0.05 for the comparison between patients with vs. those without the condition. ^b *p* < 0.05 for the overall distribution across categories of patients with vs. those without the condition.

the respective CTT area. Patients with scalp or nail psoriasis were also significantly more likely to have a history of guttate, erythrodermic, and inverse/intertriginous psoriasis morphology, and those with palmoplantar psoriasis were significantly more likely to have a history of erythrodermic, pustular, and inverse/intertriginous psoriasis morphology than patients without the respective CTT area (Table 2).

The most common comorbidities were hypertension (36.1%), hyperlipidemia (25.9%), anxiety (20.7%), and depression (20.0%). Patients with scalp psoriasis were less likely to have hypertension (33.0 vs. 38.1%; *p* = 0.020) and more likely to have Crohn's disease (1.4 vs. 0.5%; *p* = 0.041) than those without scalp psoriasis. Patients with nail psoriasis were more likely to have anxiety than those without nail psoriasis (24.2 vs. 20.0%; *p* = 0.002). Patients

with palmoplantar psoriasis were more likely to have hypertension (43.0 vs. 35.3%; *p* = 0.024), hyperlipidemia (32.7 vs. 25.0%; *p* = 0.013), anxiety (24.7 vs. 20.2%; *p* = 0.045), and Crohn's disease (2.2 vs. 0.7%; *p* = 0.032) than those without palmoplantar psoriasis. Overall, more than half of the patients (56.3%) were biologic experienced, of whom 53.9% had used ≥2 biologics (Table 2).

Disease Activity and Patient-Reported Outcomes at Enrollment

Patients had an overall mean Investigator's Global Assessment (IGA) score of 2.9 ± 0.8, body surface area (BSA) involvement of 15.5 ± 16.6%, and Psoriasis Area and Severity Index (PASI) score of 9.1 ± 8.1; the majority of patients had moderate to severe disease as assessed by IGA ≥3 (77.9%) and BSA ≥3% (89.4%), and 34.1% had a PASI

Table 3. Multivariable-adjusted disease activity and patient-reported outcome measures in patients with psoriasis at time of registry enrollment

Outcome measure ^a	Scalp psoriasis (n = 778)	No scalp psoriasis (n = 1,264)	St diff ^b	Nail psoriasis (n = 326)	No nail psoriasis (n = 1,716)	St diff ^b	Palmoplantar psoriasis (n = 223)	No palmoplantar psoriasis (n = 1,819)	St diff ^b
IGA score (0–4)	2.98 (2.97–2.99)	2.85 (2.84–2.86)	0.61	2.86 (2.85–2.87)	2.91 (2.90–2.92)	–0.21	2.95 (2.94–2.96)	2.89 (2.88–2.90)	0.28
BSA, % involvement	16.49 (16.32–16.65)	14.91 (14.77–15.06)	0.45	17.16 (16.98–17.33)	15.19 (15.05–15.34)	0.55	13.52 (13.38–13.65)	15.78 (15.63–15.94)	–0.67
PASI score (0–72)	9.64 (9.52–9.75)	8.74 (8.64–8.85)	0.35	10.72 (10.59–10.85)	8.76 (8.66–8.87)	0.75	8.65 (8.54–8.76)	9.16 (9.05–9.28)	–0.20
Patient pain (VAS 0–100)	36.39 (36.04–36.75)	36.82 (36.47–37.18)	–0.05	40.06 (39.69–40.42)	36.01 (35.65–36.36)	0.50	44.56 (44.20–44.93)	35.66 (35.33–35.99)	1.13
Patient fatigue (VAS 0–100)	38.32 (37.82–38.83)	37.41 (36.94–37.87)	0.08	39.41 (38.97–39.88)	37.49 (37.01–37.98)	0.18	41.26 (40.78–41.72)	37.35 (36.86–37.82)	0.37
Patient itch (VAS 0–100)	58.01 (57.62–58.40)	54.35 (53.99–54.72)	0.44	56.42 (56.02–56.81)	55.59 (55.20–55.97)	0.10	60.22 (59.86–60.59)	55.15 (54.79–55.54)	0.60
EQ VAS (0–100)	68.12 (67.78–68.48)	69.46 (69.12–69.81)	–0.17	66.21 (65.89–66.55)	69.48 (69.14–69.83)	–0.43	66.41 (66.07–66.75)	69.29 (68.94–69.64)	–0.37
DLQI (0–30)	8.96 (8.88–9.04)	8.96 (8.88–9.04)	0.00	9.39 (9.30–9.47)	8.87 (8.80–8.95)	0.29	10.25 (10.17–10.32)	8.79 (8.72–8.86)	0.87
WPAI domains, %									
Absenteeism (work time missed)	4.41 (4.22–4.60)	4.14 (3.97–4.32)	0.09	3.54 (3.39–3.69)	4.39 (4.20–4.59)	–0.29	5.15 (4.95–5.35)	4.14 (3.97–4.32)	0.30
Presenteeism (impairment at work/reduced on-the-job effectiveness)	18.48 (18.07–18.89)	17.01 (16.63–17.41)	0.21	16.16 (15.79–16.56)	17.84 (17.43–18.25)	–0.24	22.60 (22.14–23.04)	16.98 (16.63–17.36)	0.78
Work productivity loss (overall work impairment/absenteeism plus presenteeism)	20.68 (20.20–21.17)	18.36 (17.91–18.83)	0.29	17.36 (16.91–17.81)	19.63 (19.17–20.12)	–0.28	24.82 (24.29–25.37)	18.59 (18.16–19.02)	0.73
Activity impairment	24.89 (24.46–25.33)	25.35 (24.89–25.82)	–0.05	25.48 (25.04–25.92)	25.11 (24.68–25.56)	0.04	33.74 (33.25–34.22)	24.09 (23.67–24.51)	0.97

Data are adjusted for age, sex, race, Hispanic ethnicity, body mass index, smoking status, geographic region, psoriasis duration, psoriatic arthritis, number of comorbidities, and prior biologic use. BSA, body surface area; DLQI, Dermatology Life Quality Index; EQ VAS, EuroQol visual analog scale; IGA, Investigator's Global Assessment; PASI, Psoriasis Area and Severity Index; st diff, standardized difference; VAS, visual analog scale; WPAI, Work Productivity and Activity Impairment. ^a Data are presented as mean (95% CI). ^b A |standardized difference| < 0.1 has been taken to indicate a negligible difference in the mean or prevalence of a covariate between groups.

score >10 (online suppl. Table 1). In multivariable-adjusted models, patients with scalp psoriasis had a higher mean IGA score (2.98 vs. 2.85), BSA involvement (16.49 vs. 14.91%), and PASI score (9.64 vs. 8.74) than those without scalp psoriasis (all |standardized difference| > 0.1). Patients with nail psoriasis had higher mean BSA involvement (17.16 vs. 15.19%) and PASI score (10.72 vs. 8.76) but a lower mean IGA score (2.86 vs. 2.91) than those without nail psoriasis (all |standardized difference| > 0.1). Conversely, patients with palmoplantar psoriasis had a higher mean IGA score (2.95 vs. 2.89) but lower mean BSA involvement (13.52 vs. 15.78%) and PASI score (8.65 vs. 9.16) than those without palmoplantar psoriasis (all |standardized difference| > 0.1) (Table 3).

The overall mean pain, itch, fatigue, and EuroQoL visual analog scale (EQ VAS) scores were 36.5 ± 33.3 , 55.6 ± 33.5 , 37.7 ± 29.9 , and 69.1 ± 22.6 , respectively; the mean Dermatology Life Quality Index (DLQI) score was 8.9 ± 6.2 , and 64.4% of patients reported that their psoriasis had a moderate, very large, or extremely large effect on life (online suppl. Table 1). In multivariable-adjusted models, patients with scalp psoriasis reported a higher mean itch score (58.01 vs. 54.35), lower mean EQ VAS score (68.12 vs. 69.46), and greater mean percentage impairment while working (18.48 vs. 17.01%) and overall work impairment (20.68 vs. 18.36%) than those without scalp psoriasis (all |standardized difference| > 0.1). Patients with nail psoriasis reported higher mean DLQI (9.39 vs. 8.87), lower mean EQ VAS (66.21 vs. 69.48), and higher mean patient-reported pain (40.06 vs. 36.01), itch (56.42 vs. 55.59), and fatigue (39.41 vs. 37.49) scores than those without nail psoriasis (all |standardized difference| > 0.1). However, patients with nail psoriasis reported lower mean percentage of work time missed (3.54 vs. 4.39%), impairment while working (16.16 vs. 17.84%), and overall work impairment (17.36 vs. 19.63%) than patients without nail psoriasis (all |standardized difference| > 0.1). Patients with palmoplantar psoriasis reported higher mean DLQI (10.25 vs. 8.79), lower mean EQ VAS (66.41 vs. 69.29), and higher mean patient-reported pain (44.56 vs. 35.66), itch (60.22 vs. 55.15), and fatigue (41.26 vs. 37.35) scores than those without palmoplantar psoriasis (all |standardized difference| > 0.1). Patients with palmoplantar psoriasis also reported greater impairment in all Work Productivity and Activity Impairment questionnaire (WPAI) domains than those without palmoplantar psoriasis (work time missed, 5.15 vs. 4.14%; impairment while working, 22.60 vs. 16.98%; overall work impairment, 24.82 vs. 18.59%; and activity impairment, 33.74 vs. 24.09%; all |standardized difference| > 0.1) (Table 3).

Discussion

In this real-world study population of patients with psoriasis who initiated biologic therapy, nearly two-thirds had concomitant psoriasis in ≥ 1 CTT area and/or PsA. The observed prevalence of scalp, nail, and palmoplantar psoriasis was approximately 38, 16, and 11%, respectively. In a previous analysis of the US-based Nurses' Health Study (NHS), NHSII, and Health Professionals Follow-Up Study (HPFS), the prevalence of scalp, nail, and palmoplantar psoriasis among patients with psoriasis ranged from 45 to 56%, 23 to 27%, and 12 to 16%, respectively [35]. However, the patient populations in the NHS and NHSII were limited to female registered nurses, and the HPFS included only male healthcare professionals [35]. In the Multinational Assessment of Psoriasis and Psoriatic Arthritis (MAPP) survey, the prevalence rates of scalp and nail psoriasis were 48 and 11%, respectively; 12 and 11% of patients reported psoriasis on the palms and soles, respectively [36]. Of note, the MAPP included patients from 7 countries and patients did not have to be under the care of a healthcare provider or receiving treatment at the time of the survey [36].

In this study population, patients with psoriasis in CTT areas were more likely to have psoriasis in other CTT areas than those without CTT areas. Higher proportions of patients with scalp psoriasis had nail and palmoplantar psoriasis compared with those without scalp psoriasis (Fig. 2; Table 2). Additionally, the majority of patients with nail or palmoplantar psoriasis had psoriasis in ≥ 1 other CTT area (Fig. 2). Patients with psoriasis in CTT areas were also more likely to have other concomitant nonplaque psoriasis morphologies (Table 2). Previous studies have provided additional evidence that patients with CTT localizations of psoriasis may frequently have >1 CTT area affected or a concomitant nonplaque phenotype [35]. Pooled data from the NHS, NHSII, and HPFS showed that among 3,850 patients with psoriasis, the prevalence of scalp + nail, scalp + palmoplantar, and nail + palmoplantar psoriasis was 14–17%, 5–7%, and 5–7%, respectively [35]; in our study population, the prevalence of these combinations among the 2,042 included patients was approximately 13, 6, and 4%, respectively. Overall, these data suggest that patients presenting with 1 CTT area or a nonplaque phenotype should be evaluated for other types.

Overall, patients with psoriasis in CTT areas tended to report worse health-related QOL. Patients in all CTT groups reported significantly higher itch and lower EQ VAS scores than those without the respective CTT local-

ization. Additionally, patients with nail or palmoplantar psoriasis reported higher pain, fatigue, and DLQI scores than those without nail or palmoplantar psoriasis, and higher proportions of patients with scalp or palmoplantar psoriasis reported work impairment compared with those without scalp or palmoplantar psoriasis. These observations are consistent with those of previous cross-sectional and survey-based studies evaluating health-related QOL in patients with psoriasis in CTT areas, in which substantial physical and psychosocial impacts of CTT areas on patients with psoriasis have been shown [28, 37–40]. The results of our study provide further evidence of the burden of psoriasis in CTT areas on patients' QOL and indicate that psoriasis localized to CTT areas has a significantly greater impact on health-related QOL than psoriasis localized to other areas.

This study is subject to the general limitations of real-world observational studies. Patients in this study are routinely seen and treated by dermatologists voluntarily participating in the Corrona Psoriasis Registry and may not be representative of patients with psoriasis seen elsewhere in general practice. Diagnosis of psoriasis and psoriasis morphology was at the discretion of the treating dermatologist, which may affect prevalence estimates of CTT areas. In 2007, the International Psoriasis Council classified palmoplantar psoriasis and palmoplantar pustulosis as separate conditions [41]. However, this distinction remains controversial [42–44], and it is therefore possible that some patients diagnosed with palmoplantar psoriasis in our study cohort had palmoplantar pustulosis. Notably, nearly half of the patients (46%) with palmoplantar psoriasis in our study were male and 44% had never smoked. In contrast, patients with palmoplantar pustulosis are predominantly female and current or former smokers [43, 45–48]. Finally, our study population was limited to patients who initiated a biologic therapy at the time of registry enrollment; thus, our results are not generalizable to patients who are not currently receiving treatment or are receiving nonbiologic treatment.

Conclusion

In this real-world study of patients with psoriasis initiating biologic therapy, two-thirds had ≥ 1 CTT localization of psoriasis and/or PsA. Patients with psoriasis in any CTT area were more likely to have other CTT areas and nonplaque psoriasis morphologies than patients without the respective CTT area, indicating that patients with 1 CTT area or nonplaque morphology should be evaluated for

others. Patients with psoriasis in CTT areas had worse QOL than those without psoriasis in the respective CTT area. These results highlight the burden of psoriasis in CTT areas on patients' QOL and suggest that dermatologists should be mindful of these conditions when selecting treatments. Further studies are needed to evaluate the effectiveness of therapies in patients with psoriasis in CTT areas.

Key Message

Psoriasis in challenging-to-treat areas imposes a significant burden on patients' health-related quality of life.

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Statement of Ethics

The Corrona registry and its investigators were reviewed and approved by a central institutional review board (IRB; IntegReview, Corrona-PSO-500). For academic investigative sites that did not receive a waiver to use the central IRB, full board approval was obtained from the respective governing IRBs. All registry participants were required to provide written informed consent and authorization prior to participating.

Disclosure Statement

K.C.D. is an investigator and consultant for Amgen, AbbVie, Celgene, Eli Lilly, Janssen, Bristol-Myers Squibb, Stiefel, Novartis, Pfizer, Sienna, and UCB. M.A.M., R.W.H., and M.M.C. are employees of Corrona, LLC. K.G. is an investigator for AbbVie, Amgen, Boehringer Ingelheim, Celgene, Eli Lilly, and Janssen and a consultant for AbbVie, Amgen, Boehringer Ingelheim, Celgene, Dermira, Eli Lilly, Janssen, Novartis, and Pfizer. A.G. and R.G. were employees of Novartis Pharmaceuticals Corporation at the time of this study. M.L. is an employee of Icahn School of Medicine at Mount Sinai, which receives research funds from AbbVie, Amgen, Boehringer Ingelheim, Celgene, Eli Lilly, Janssen/Johnson & Johnson, Kadmon, MedImmune/AstraZeneca, Novartis, Pfizer, Valeant, and Vidac and is also a consultant for Allergan, Aqua, Corrona, LEO Pharma, and Promius.

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Author Contributions

All authors made substantial contributions to the conception and design, execution, or analysis and interpretation of the data; were involved in drafting and critically revising the manuscript; gave necessary attention to ensure the integrity of the work; and read and approved all versions of this paper. Statistical analyses were performed by M.A.M., R.W.H., and M.M.C.

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