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Enhanced impact of psoriasis severity on the treatment demands of patients during the COVID-19 pandemic: A cross-sectional study based on a national psoriasis registry in China

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Original Research

Enhanced impact of psoriasis severity on the treatment demands of patients during the COVID-19 pandemic: A cross-sectional study based on a national psoriasis registry in China

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1 Abstract

Objectives: The personalized treatment demands of patients with psoriasis did not get
significant attention during the pandemic lockdown. This study aimed to investigate the
treatment demands of patients with psoriasis with different severities, stratified by COVID-19
pandemic conditions.

Design: Cross-sectional study design.

Setting: Multicenter study based on a national psoriasis registry in China.

Participants: A total of 22,425 adult patients with psoriasis were enrolled between August
2020 and September 2021.

Primary and Secondary Outcome Measures: The primary outcomes were patient demands for quick healing of skin lesions and improving mental health, which were collected by questionnaires. Multivariable logistic models were used to examine the impact of disease severity, as measured by Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA), and Investigator's Global Assessment (IGA), on treatment demands, as stratified by COVID-19 pandemic conditions (lockdown vs. non-lockdown).

Results: Increasing PASI score significantly increased patient demands for rapid healing of skin lesions and improving mental health during non-lockdown periods. The magnitude of both associations further increased during the COVID-19 lockdown from an odds ratio (OR) of 1.45 (95% confidence interval [CI] 1.27-1.65) to 2.19 (95% CI 1.57-3.05) and 2.11 (95% CI 2.03–2.40) to 2.81 (95% CI 2.24–3.55), respectively. The skin lesion healing demand was more triggered by the overall irritation level (measured by IGA, OR=1.64, 95% CI 1.35–1.99 during non-lockdown periods versus OR=2.70, 95% CI 1.63-4.49 during lockdowns); while the mental health improving demand was more triggered by lesion coverage (measured by BSA, OR=2.01, 95% CI 1.85–2.19 versus OR=3.27, 95% CI 2.57–4.15).

Conclusions: Psoriasis aggravation significantly increased patients' treatment demands,

- 26 especially during lockdowns. The used psoriasis severity measures highlighted patients'
- 27 treatment demands differently. This suggests more accessible and personalized healthcare
- 28 for patients with psoriasis should be available during future pandemics.

29	
	Strengths and limitations of this study
30	• This is, to date, the largest study investigating the association between psoriasis severity
31	and treatment demands from the patients' perspective, and the first study comparing the
32	aforementioned association between a lockdown and a non-lockdown period.
33	 Since the used measures assessed different aspects of disease severity, this study
34	compared multiple perspectives of disease severity on each treatment demand, aiming
35	to help recognize patients' needs according to their clinical manifestations.
36	• As most previous studies focused on the quality of life of patients with psoriasis, this
37	study further investigated the impact of psoriasis on treatment demands mediated by
38	quality of life.
39	• The study enrolled patients from specific dermatological clinics, and a certain proportion
40	of patients declined the enrollment request. Thus, the study population may not
41	represent the general psoriasis population.
42	• There was an issue regarding missing data in this study. However, as the missing rate
43	was not high, and missing at random was considered, a complete case analysis was
44	considered sufficient for handling missing data and was, therefore, used.
45	
46	INTRODUCTION
47	Psoriasis is a chronic, non-fatal disease primarily affecting the skin. The prevalence of
48	psoriasis varies geographically, with 0.14% and 1.99% of the population in East Asia and
49	Australasia being affected, respectively [1]. In China, the prevalence was 0.12% in 1987 and
50	0.47% in 2012 [2]. Apart from skin lesions, psoriasis is also now recognized as a systemic
51	inflammatory disorder that relates to various comorbidities, such as metabolic syndrome,
52	arthritis, malignancy, and so on [3]. Poor appearances, together with comorbidities,
53	significantly impair patients' daily functioning and cause significant psychological distress [4]
54	which can result in depression, suicidal ideation, and substance abuse [5,6], causing high
55	social burdens, especially during the recurrent coronavirus disease 2019 (COVID-19)
56	pandemics [7,8].
57	Current clinical diagnosis and treatment for psoriasis must follow appropriate guidelines and
58	consensus. Therefore, the choice of treatment for psoriasis primarily depends on the
F.0	objective assessment of lesion severity of the disease, yet the demands of the patient are
59	
59 60	often neglected [9,10]. However, due to the chronic, non-fatal characteristics of psoriasis,

individual perceptions of the disease can determine the impact of psoriasis on the quality of life of patients, which may then affect their treatment demands [11,12]. Thus, the treatment decisions should be driven by the real needs and expectations of each individual. Furthermore, since healthcare access (e.g. emerged telemedicine) [13-16], as well as the clinicians' treatment considerations to control psoriasis, have all changed during the recurrent COVID-19 pandemics [17], patients' perception of psoriasis and further their treatment demands may altered accordingly. From a healthcare-seeking behavior perspective, common changes among patients with psoriasis during the COVID-19 pandemic included the canceling or deferring of appointments, nonadherence to treatment, prolonged prescription, and treatment-change requirements [7,18]. Patients may become more anxious about their psoriasis lesions due to the difficulty in accessing healthcare. In contrast, from a quality of life perspective, the social-activity aspect assessed in a quality of life questionnaire became irrelevant during lockdown, which led to paradoxically improved quality of life among patients with psoriasis during the COVID-19 lockdown [19]. Patients may perceive their psoriasis lesions as more acceptable because they are less worried about skin lesion appearances due to restricted social activities, and are more fearful of COVID-19 than non-fatal psoriasis. As a result, how patients' treatment demands changed during pandemics remains unknown. Thus, it is essential to re-assess patients' treatment demands to improve personalized treatment during the pandemic. However, studies on changes in treatment demands from patients' perspectives during pandemics are limited. This study aimed to examine the treatment demands of patients with psoriasis with varying disease severity and other clinical and personal characteristics in a real-world setting throughout the recurrent COVID-19 pandemics, hoping to provide references for

41 84 personalized treatment strategies not only for patients with psoriasis during COVID-19

42 85 pandemic but also for patients with all other chronic diseases in any future pandemic
 43

46 87 MATERIALS AND METHODS

lockdowns.

48 88 Study design, patients, and data collected

This was a cross-sectional, multicenter study based on a nationwide real-world big data collection platform established by the Psoriasis Standardized Diagnosis and Treatment Center (also named Psoriasis Center) and led by the National Clinical Research Center for Skin and Immune Disease [20]. This data platform is the first and currently the largest psoriasis registry in China, and as of September 2021, had included data of 32,014 patients with psoriasis from 228 hospitals across China. The registry collects data on demographics,

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medical history, clinical assessment, previous and current treatments for psoriasis, self-reported quality of life, and treatment demands at enrollment. All patients provided informed consent for publication before their details were entered into the registry. The establishment of this big data collection platform was approved by the Human Genetic Resources Management Office of the Ministry of Science and Technology of China (approval number: 2022-CJ0021) and the ethics committee of Peking University First Hospital (approval number: 2020-scientific research-255) for use in clinical studies. The data preprocessing standards for derived variables and variables with potentially mistaken values are listed in Table S1 (Supplemental Material).

18104All patients aged \geq 18 years enrolled between August 2020 to September 2021 with complete19105baseline data were included. The differences in baseline characteristics between patients21106with complete and incomplete data are shown in Table S2 (Supplemental Material).

23 107 Patient and public involvement
 24

Patients were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

29 110 Study measures

The study outcomes were patients' treatment demands, which were collected in the form of multiple choices in a questionnaire containing the two primary treatment demands: healing skin lesions quickly and improving mental health. The questionnaire also asked about other demands, including reducing social discrimination, working and socializing normally, relieving itchy feelings, relieving painful or burning feelings, and reducing the side effects of treatment and disease relapses. Quality of life was additionally assessed by the Dermatology Life Quality Index (DLQI).

The main exposure was psoriasis severity, which was assessed by the Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA), and the 5-point Investigator's Global Assessment (IGA) [9,10]. According to the guidelines for the diagnosis and treatment of psoriasis in China (2018), PASI score was categorized as mild (<3), moderate (3-<10) and severe (\geq 10), whereas BSA (%) was categorized as mild (<3%), moderate (3% to <10%), and severe (≥10%) [21]. The 5-point IGA categorized the severity level as clear/almost clear (0/1), mild (2), moderate (3), and severe (4). Provincial COVID-19 data was summarized from the official website of the National Health

⁵⁵ 126 Commission of the People's Republic of China
 ⁵⁶

- ⁵⁷ 127 (<u>http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml</u>). Considering the maintenance period of
- ⁵⁸₅₉ 128 both epidemic control measures and public response to the pandemic, the 7 days following

the last day in which a new case was recorded were further classified into the same
 pandemic period. The COVID-19 pandemic variable was treated as binary according to the
 geographical location and enrolled day of each patient.

132 Statistical analysis

Descriptive statistics were performed for each variable stratified by each treatment demand
using frequencies (percentages) for categorical variables and median (interquartile range
[IQR]) for continuous variables. Categorical variables were compared using chi-squared
tests, whereas continuous variables were compared using the Kruskal–Wallis H test.

Multivariable logistic regression models were used to investigate the impact of psoriasis severity, as measured by PASI, BSA, and IGA, separately, on each treatment demand stratified by whether the patient was enrolled during the COVID pandemic. To reduce potential confounding factors, all models were adjusted for demographic characteristics (sex, age, body mass index [BMI], marriage status, education, employment, and smoking habits) and clinical characteristics (psoriasis duration, family history, disease phenotype, nail/scalp/genital/palmoplantar involvement, comorbidities, and previous treatment). PASI, BSA, and IGA values were separately modeled in relation to each treatment demand, and were treated as continuous and categorical variables separately. A Q-test attached to the fixed effect model was performed to detect the heterogeneity between the impact of psoriasis severity on treatment demands during the COVID-19 pandemic lockdowns and normal periods. Mediation analysis was employed to investigate the effect of PASI/BSA/IGA on treatment demands mediated by DLQI, adjusting for the same confounding set above and additionally for COVID-19 lockdowns. Other potential factors influencing the treatment demands were examined using the same multivariable logistic regression models investigating the impact of PASI on guick skin healing and mental health improvement demands while adding the COVID-19 pandemic as a covariate. All data analysis was conducted using STATA/SE (StataCorp LLC 2021, Stata Statistical Software: Release 17, College Station, TX), and a *P*-value <0.05 was considered statistically significant.

48 156 **RESULTS**

50 157 General characteristics51

Among the 29,412 adult patients enrolled as of September 2021 (Table S2, see Supplemental Material), 22,425 with complete baseline information from 212 tertiary hospitals across China were enrolled in this study. Exactly 65.0% of patients were men (n=14,567). The median age was 40 (IQR, 31-54) years, and the percentages of different age groups were as follows: 18-45 years, 60.3% (n = 13,515); 46-60 years, 26.9% (n =

Page 9 of 44

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6,033); ≥61 years, 12.8% (n = 2,877). The median PASI and DLQI scores were 7.2 and 8, respectively. Exactly 12.1% of the patients (n = 2,706) were enrolled during a COVID-19 lockdown in their provinces. Moreover, 89.7% (n = 20,111) and 38.0% (n = 8,531) of the patients demanded a speedy healing of the skin lesions and mental health improvement, respectively (Table 1).

Patients demanding the rapid healing of skin lesions tended to be female, younger, employed, unmarried, have a college degree, have current smoking habits, enrolled during a normal period without the COVID-19 lockdown, have a shorter psoriasis duration, have a positive family history, have pustular or guttate psoriasis, have nail or scalp involvement, and have a severer psoriasis condition, as measured by PASI, BSA, and IGA, while not having palmoplantar involvement, comorbidities, such as psoriatic arthritis (PsA), or a history of use of biologics (all P < 0.05). By comparison, patients demanding mental health improvement tended to be unemployed, have a longer psoriasis duration, have plaque, pustular, or arthropathic psoriasis, have lesions on special areas including nails, scalps, hands/soles, and genitals, have more severe psoriasis conditions, while not having a college degree, smoking habits, erythrodermic or guttate psoriasis, or comorbidities (all P < 0.05). Patients' characteristics stratified by other treatment demands are shown in Table S3 (Supplemental Material).

Impact of psoriasis severity on treatment demands stratified by the COVID-19 pandemic

Both multivariable logistic regression and trend tests confirmed that the increasing psoriasis severity, as measured by PASI, significantly stimulated patients' primary treatment demands of healing skin lesions rapidly (odds ratio [OR], 1.45; 95% confidence interval [CI], 1.27–1.65; P <0.001 for severe PASI versus mild PASI; and OR, 1.02; 95% CI, 1.01–1.02; P <0.001 in the trend test) and improving mental health (OR, 2.21; 95% CI, 2.03–2.40; P <0.001 for severe PASI versus mild PASI; and OR, 1.03; 95% CI, 1.02–1.03; P <0.001 in the trend test) during a normal period without COVID-19 lockdown (shown in Fig. 1a-b; and Table S4 [Supplemental Material]). The disease severity-triggered primary treatment demands further increased during the COVID lockdowns, including healing skin lesions rapidly (OR, 2.19; 95% CI, 1.57-3.05 for severe PASI versus mild PASI; P < 0.001) and improving mental health (OR, 2.82; 95% CI, 2.24–3.55 for severe PASI versus mild PASI, P < 0.001), despite the statistical insignificance (both P=0.064 in the heterogeneity Q-test). Other treatment demands, including reducing social discrimination, working and socializing normally, relieving painful or burning feelings, relieving itchy feelings, and reducing the treatment side effects, were also significantly stimulated by deteriorated skin conditions measured by PASI (all P

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<0.05); moreover, the degree of this stimulation further intensified during the COVID-19 lockdown (shown in Fig. 1c-g). The exception was the demand for reducing relapses, which significantly declined as PASI increased. Nevertheless, the magnitude of this decline decreased during the pandemic lockdown (OR, 0.61; 95% CI, 0.49–0.75, P < 0.001 for severe PASI versus mild PASI during a non-COVID-19 period; and OR, 0.81; 95% CI, 0.58–1.12; P=0.196 during a COVID-19 lockdown; heterogeneity Q-test, P=0.001; shown in Fig. 1h). Impact of psoriasis severity by different instruments on treatment demands stratified by the COVID-19 pandemic Similar patterns of change in each treatment demand were also found as BSA and IGA increased during the normal period. However, the two measures motivated the treatment demands slightly differently during the pandemic lockdowns. Specifically, the magnitude of increasing BSA-triggered demands of rapidly healing skin lesions hardly increased during the pandemic lockdowns (OR, 1.33; 95% CI, 1.17–1.50; P <0.001 for severe BSA versus mild BSA during a normal period; and OR, 1.38; 95% CI, 0.999–1.896; P=0.051 during the pandemic lockdown; heterogeneity Q-test, P=0.663), whereas that of IGA-triggered demands significantly increased (OR, 1.64; 95% CI, 1.35–1.99; P < 0.001 for IGA=4 versus IGA=0/1 during the normal period; and OR, 2.70; 95% CI, 1.63–4.49; P < 0.001 during the pandemic lockdown; heterogeneity Q-test, P=0.005). In contrast, the magnitude of the increase in demands of improving mental health triggered by BSA significantly increased during the pandemic (OR, 2.01; 95% CI, 1.85–2.19; P <0.001; and OR, 3.27; 95% CI, 2.57–4.15; P <0.001; heterogeneity Q-test, P <0.001), whereas that triggered by IGA hardly changed (OR, 2.21; 95% CI, 1.94–2.51; P <0.001; and OR, 1.91; 95% CI, 1.36–2.68; P <0.001; heterogeneity Q-test, P=0.971; shown in Fig. 1a-b and Table sS5 & S6 [Supplemental Material]). Impact of psoriasis severity on treatment demands mediated by quality of life

Further mediation analysis showed that increasing PASI motivated patients' treatment demands mainly by deteriorating their quality of life, including reducing social discrimination (mediated proportion, 49.0%), improving mental health (47.1%), working and socializing normally (72.1%), relieving painful (40.8%) or itchy (73.2%) feelings, and reducing the treatment side effects (74.3%) (Table 2). However, the proportion of the DLQI-mediated effect was small in the total effect of PASI on the demands for reducing relapses (7.6%) and quickly healing skin lesions (0.6%). The abovementioned results were replicated when disease severity was examined by BSA and IGA.

58 231 Potential factors influencing treatment demands

2		
3	232	Apart from disease severity, multivariable logistic regression analysis also identified female
4 5	233	sex (OR, 1.23; 95% CI, 1.11–1.36; <i>P</i> <0.001), smoking status (OR, 1.17; 95% CI, 1.04–1.30;
6 7	234	P=0.005), pustular psoriasis (OR, 1.71; 95% CI, 1.26–2.32; P=0.001), and nail involvement
8	235	(OR, 1.28; 95% CI, 1.14–1.44, <i>P</i> <0.001) to be significantly correlated with a higher demand
9 10	236	for quick skin lesion healing. However, older age (OR, 0.994; 95% CI, 0.991–0.998;
11	237	P=0.004), married status (OR, 0.82; 95% CI, 0.72–0.94; P=0.003), unemployed status (OR,
12 13	238	0.82; 95% CI, 0.70–0.95; <i>P</i> =0.010), COVID-19 lockdown (OR, 0.87; 95% CI, 0.77–0.99;
14 15	239	<i>P</i> =0.037), arthropathic psoriasis (OR, 0.55; 95% Cl, 0.47–0.64; <i>P</i> <0.001), palmoplantar
15 16	240	involvement (OR, 0.75; 95% CI, 0.67–0.85; <i>P</i> <0.001), and comorbidities (OR, 0.86; 95% CI,
17 18	241	0.76–0.97; <i>P</i> =0.018) were found to be significantly correlated with lower demand (Table 3).
19 20	242	Moreover, the demand for the improvement of mental health was significantly higher in
21	243	patients with arthropathic psoriasis (OR, 1.22; 95% CI, 1.09–1.37; <i>P</i> =0.001), guttate
22 23	244	psoriasis (OR, 0.78; 95% CI, 0.71–0.84; <i>P</i> <0.001), and palmoplantar involvement (OR, 1.09;
24 25	245	95% CI, 1.01–1.18, <i>P</i> =0.027). However, this was lower among patients with older age (OR,
25 26	246	0.993; 95% Cl, 0.991–0.996, <i>P</i> <0.001), higher BMI (OR, 0.9955; 95% Cl, 0.9914–0.9996;
27 28	247	<i>P</i> =0.030), a college education (OR, 0.90; 95% CI, 0.84–0.95; <i>P</i> =0.001), smoking status (OR,
29	248	0.81; 95% CI, 0.75–0.86; <i>P</i> <0.001), pustular psoriasis (OR, 0.77; 95% CI, 0.65–0.92;
30 31	249	<i>P</i> =0.003), and comorbidities (OR, 0.90; 95% CI, 0.83–0.97; <i>P</i> =0.012).
32 33 34	250	DISCUSSION
35 36	251	In this cross-sectional study, it was observed that patient demands for healing skin lesions

and improving mental health significantly increased as psoriasis worsened, especially during the COVID-19 pandemic. Different psoriasis severity measures have different emphases in reflecting patients' treatment demands, which were magnified during the pandemic. The impact of disease severity on most treatment demands was mediated by deteriorated quality of life, except for the demands of rapid skin healing and relapse reduction, and thus other factors that stratified major treatment demands were also examined.

Patient-centered intervention is crucial for the treatment of psoriasis due to the chronic and non-fatal characteristics of the condition, in addition to the considerable disparity in prices of various treatment choices, especially in recent years with recurrent pandemic lockdowns. During a normal period, all treatment demands, ranging from improving the appearance of skin lesions and relieving irritating symptoms to psychological and daily functional support, significantly increased as psoriasis deteriorated, suggesting the need for more intensive treatment and psychological counseling for patients. The only exception was the demand for reducing relapses, which was demanded in only 4.7% of patients and further decreased as disease severity increased, indicating that most Chinese patients have recognized the

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chronic nature of psoriasis and accepted the recurrent relapses and living with a small number of skin lesions and thereby suggesting that clinicians should be aware that patients may have poor compliance in their remission periods.

Compared to normal periods, all treatment demands, including those for rapidly healing skin lesions and improving mental health, were further triggered by disease severity during pandemic lockdowns (shown in Fig. 1). This differed from previous reports, which demonstrated that patients' quality of life, as measured by DLQI, was less influenced by psoriasis during pandemic lockdowns [19]. The reason for the difference in results is complex. On one hand, because social activities were restricted, patients worried less about skin lesion appearance when socializing and were more fearful about contracting infectious diseases rather than the non-fatal psoriasis. Thus, better quality of life, as indicated by DLQI, was observed. Our multivariable logistic models also showed that the COVID-19 pandemic itself was a protective factor in reducing the demands of healing skin lesions (Table 3). On the other hand, the restrictions in traveling and difficulties in accessing medical resources for common chronic diseases may enhance treatment demands. Taking all these factors together, the study showed enhanced treatment demands in patients with more severe psoriasis during the pandemic lockdowns, suggesting that patients' treatment demands were more influenced by psoriasis conditions and difficulties in accessing healthcare facilities rather than the reduced need for socializing. The restrictions in traveling and difficulties in accessing medical resources for common chronic diseases may further contribute to an enhanced treatment demand during the pandemic lockdowns, indicating for clinicians that a more intensive treatment strategy with lasting effects and enhanced mental support is needed during lockdown, despite the reduced concern regarding socialization caused by lesion appearances. A more accessible pathway, such as telemedicine and online medicine service, should also be promoted to facilitate access to healthcare during pandemic lockdowns. All these factors might be generalized and integrated into the management of other chronic non-fatal diseases, such as atopic diseases, during future pandemics to meet patients' treatment needs.

To further help recognize patients' needs according to their clinical manifestations in daily clinics, this study compared the impact of disease severity by different measures on each treatment demand. PASI, BSA, and IGA are all instruments measuring psoriasis severity and were found to be significantly correlated with one another [22]. PASI takes both the area coverage and lesion appearance into account, yet it is time consuming to calculate. In contrast, BSA and IGA are easier to understand, yet only represent the lesion coverage or lesion appearance [9,10]. In this study, an overall more irritating skin appearance presented

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by a higher IGA further stimulated the demands for the quick relief of skin lesions themselves during the pandemic lockdown, whereas the larger lesion coverage presented by higher BSA further motivated demands for psychological solutions, including improving mental health and reducing social discrimination. Since PASI is difficult to obtain, this study suggests that BSA should be used as a "first-line" surrogate to represent the enhanced psychological needs of patients, whereas IGA should be used to represent the increased need for more intensive therapy during pandemic lockdowns. As most previous studies focused on the quality of life of patients with psoriasis, which revealed that worsened quality of life was associated with worsened psoriasis [23,24], this study further investigated the impact of psoriasis on treatment demands mediated by quality of life. In this study, quality of life was measured by DLQI, which reflected patients' lesion feelings, daily activities, leisure, work and study, personal relationships, and treatment burden. We confirmed that increasing disease severity deteriorated patients' quality of life based on the abovementioned aspects, which further motivated corresponding treatment demands. However, although prevalent in the psoriasis population, <2% of the demand for guick skin lesion healing was mediated by deteriorated guality of life, indicating the existence of other factors influencing treatment demands. Thus, this study further examined other factors potentially stratifying treatment demands.

Young and female patients were found to have worse quality of life in previous studies [23,25,26], as well as higher treatment demands for rapid skin lesion healing in this study. Unmarried and employed patients without comorbidities were also found to have stronger demands for quick healing. These might be because female, young, unmarried, and employed patients have higher requirements for self-image, and patients without comorbidities have fewer concerns regarding polypharmacy and drug interactions due to underlying diseases. Additionally, the same demands for quick healing were higher in patients with pustular psoriasis, which presents with fever, painful skin, and frequent flare-ups [27], and nail psoriasis, which undermines daily function [28]. Thus, a more intensive treatment strategy is needed for these patients. Additionally, more psychological care should be provided to younger patients without a college education, as they may lack a basic understanding of the disease and were found to have higher demands for mental support in this study. The same support was also needed in patients with arthropathic psoriasis and palmoplantar psoriasis, which were linked with internalized stigma and poorer quality of life [29,30].

Although, to our knowledge, this study is the largest real-world study to date investigating the
 treatment demands of patients with psoriasis during the pandemic lockdowns, there were

limitations. First, the Psoriasis Center program enrolled patients from specific dermatological clinics, and a certain proportion of patients declined the enrollment request. Thus, the study population may not represent the general psoriasis population. Second, there was an issue regarding the missing data for this data platform. However, as the missing rate was not high, and missing at random was considered (Table S2 [Supplemental Material]), a complete case analysis was considered sufficient for handling missing data and, therefore, used. Third, since the information on residence place was not collected, the COVID-19 pandemic information was matched to each patient only at a province level, even though the pandemic was prevented with a precise approach in China.

18 346 CONCLUSION

An increase in psoriasis severity significantly stimulates patients' treatment demands from quickly healing skin lesions and improving mental health aspects, especially during the pandemic lockdowns, indicating the need for an accessible pathway for patients with psoriasis getting more intensive treatment and mental support during future pandemics. To better recognize and meet patients' treatment demands during the pandemic, we suggest that BSA is used to determine the psychological needs of patients, while IGA should be used to reflect the desire to quickly heal lesions. Other demographic and clinical characteristics of each patient should also be considered for a more personalized treatment strategy during future pandemics. Moreover, since the COVID-19 pandemic is nearing its end in many countries, the results of this study could provide hints for personalized treatment for patients with non-fatal chronic diseases in future pandemic lockdowns.

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52 53	385	This study was conducted using deidentified data from the real-world data collection platform
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57 58		
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FIGURE LEGENDS

Fig. 1. Odds ratio for the association between each treatment demand and psoriasis severity by different measures (PASI/BSA/IGA) during COVID-19 lockdowns (red line) and non-lockdown periods (blue line).

Fig. 1. a Treatment demand for healing skin lesions rapidly

Fig. 1. b. Treatment demand for improving mental health

Fig. 1. c. Treatment demand for reducing social discrimination

Fig. 1. d. Treatment demand for working and socializing normally

Fig. 1. e. Treatment demand for relieving painful or burning feelings

Fig. 1. f. Treatment demand for relieving itchy feelings

Fig. 1. g. Treatment demand for reducing the side effects of treatment

Fig. 1. h. Treatment demand for reducing relapses.

PASI: Psoriasis Area and Severity Index; BSA: Body Surface Area; IGA: Investigator's Global Assessment.

Page 21	of 44
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Tables

Table 1. Demo

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ble 1. Demographic a	nd clinical char Healing skin lesi		ratified by	primary treatmen	t demand see relation		Total (n=22,425)
	Yes (n=20,111)	No (n=2314)	P value	Yes (n=8531)	No (n=1 3 8 9 9)	P value	-
Male, n (%)	13,005 (64.7)	1562 (67.5)	0.007	5491 (64.4)	9076 (65 35 5	0.144	14,567 (65.0)
Age, y, median (IQR)	40 (31–53)	42 (33–55)	<0.001	40 (31–53)	40 (31–54) je so	0.227	40 (31–54)
BMI, kg/m ² , median (IQR)	24.0 (21.7–24.0)	24.2 (21.9– 26.9)	0.099	24.0 (21.8–26.7)	24.1 (21 24.7 (21 24.8) ABE MEE	0.405	24.0 (21.7–26.7)
Jnemployment [*] , n (%)	1755 (8.7)	239 (10.3)	0.010	833 (9.8)	1161 (8. 8)	<0.001	1994 (8.9)
Married, n (%)	15,316 (76.2)	1888 (81.6)	<0.001	6544 (76.7)	10,660 (26.7)	0.979	17,204 (76.7)
Bachelor's degree, n (%)	7064 (35.1)	764 (33.0)	0.044	2860 (33.5)	4968 (35 🔤) 💆	0.001	7828 (34.9)
Current smoker, n (%)	5443 (27.1)	580 (25.1)	0.040	2119 (24.8)	3904 (2821)	<0.001	6023 (26.9)
COVID-19 lockdowns, n %)	2394 (11.9)	312 (13.5)	0.027	1032 (12.1)	1674 (1221) bin d similar 6 (1–14)ar on	0.913	2706 (12.1)
^D soriasis duration, y, median (IQR)	6 (2-14)	8 (2-15)	<0.001	8 (2-15)	6 (1–14) 6 (1–14)	<0.001	6 (2-14)
Family history, n (%)	3459 (17.2)	357 (15.4)	0.032	1452 (17.0)	2364 (17 d) e	0.991	3816 (17.0)
Psoriasis phenotype [†] , n (%))				3, 20 >log		
Plaque psoriasis	16,335 (81.2)	1896 (81.9)	0.406	7105 (83.3)	2364 (1750) 8, 2025 11,126 (\$0.15at	<0.001	18,231 (81.3)
Erythrodermic psoriasis	219 (1.1)	23 (1.0)	0.675	121 (1.4)	121 (0.9) A	0.005	242 (1.1)
Pustular psoriasis	609 (3.0)	49 (2.1)	0.014	216 (2.5)	442 (3.2) Geo	<0.001	658 (2.9)
Guttate psoriasis	2739 (13.6)	277 (12.0)	0.028	978 (11.5)	2038 (14.7) 📴	<0.001	3016 (13.4)
					2038 (14.7) Bibliographique		20

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Arthropathic psoriasis	1293 (6.4)	297 (12.8)	<0.001	668 (7.8)	922 (6.6) gr	0.001	1590 (7.1)	
Lesions on special areas, r	n (%)				n 17 ng fo			
Nail	4861 (24.2)	504 (21.8)	0.011	2130 (25.0)	3235 (23 c 3) _	0.004	5365 (23.9)	
Scalp	13,127 (65.3)	1451 (62.7)	0.014	5709 (66.9)	8869 (63 8 8 5 L	<0.001	14,578 (65.0)	
Palmoplantar	3928 (19.5)	530 (22.9)	<0.001	1863 (21.8)	2595 (18 ميز م ر کړ	<0.001	4458 (19.9)	
Genital	2681 (13.3)	333 (14.4)	0.157	1281 (15.0)	1733 (12 5 5 1 × 4	<0.001	3014 (13.4)	
Disease severity, median (l	IQR)				o tej			
PASI	7.2 (3.0–15.0)	5.9 (2.6–12.0)	<0.001	9.1 (3.9–17.4)	6.0 (2.7-j] 2 8	<0.001	7.2 (3.0–14.6)	
BSA, %	10.0 (3.0–30.0)	9.2 (3.0–22.4)	<0.001	14.0 (5.0–30.0)	8.0 (3.0-25 20 C	<0.001	10.0 (3.0–30.0)	
IGA	3 (2-3)	2 (2-3)	<0.001	3 (2–3)	3 (2-3) ata 1 fro	<0.001	3 (2–3)	
DLQI, median (IQR)	8 (3-12)	8 (2-12)	0.072	10 (6–15)	6 (2-10) min. 50	<0.001	8 (3–12)	
Comorbidity [‡] , n (%)	2850 (14.2)	395 (17.1)	<0.001	1177 (13.8)	2068 (149)	0.010	3245 (14.5)	
Previous use of biologics§	1726 (8.6)	256 (11.1)	<0.001	732 (8.6)	1250 (9.🔂 🍯	0.286	1982 (8.8)	

BMI, body mass index; BSA, Body Surface Area; DLQI, Dermatology Life Quality Index; IGA, Investigator's Global ssessment; IQR, interquartile range; and PASI, Psoriasis Area and Severity Index. *The unemployment rate was calculated in the working-age population, which excluded retired patients and students. *Phenotypes were not mutually exclusive, thus the total percentage was higher than 100%.

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[†]Phenotypes were not mutually exclusive, thus the total percentage was higher than 100%. [‡]Comorbidity presented the existence of any disease conditions, including cardiovascular diseases, respiratory diseases, kidney diseases, rheumatic

diseases, digestive diseases, tumors, endocrine diseases, and so on.

[§]Biologics included tumor necrosis factor-α inhibitors and interleukin inhibitors.

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Table 2. Proportion of causal effect of disease severity or	• • • • • • • • • • • • • • • • • • •	
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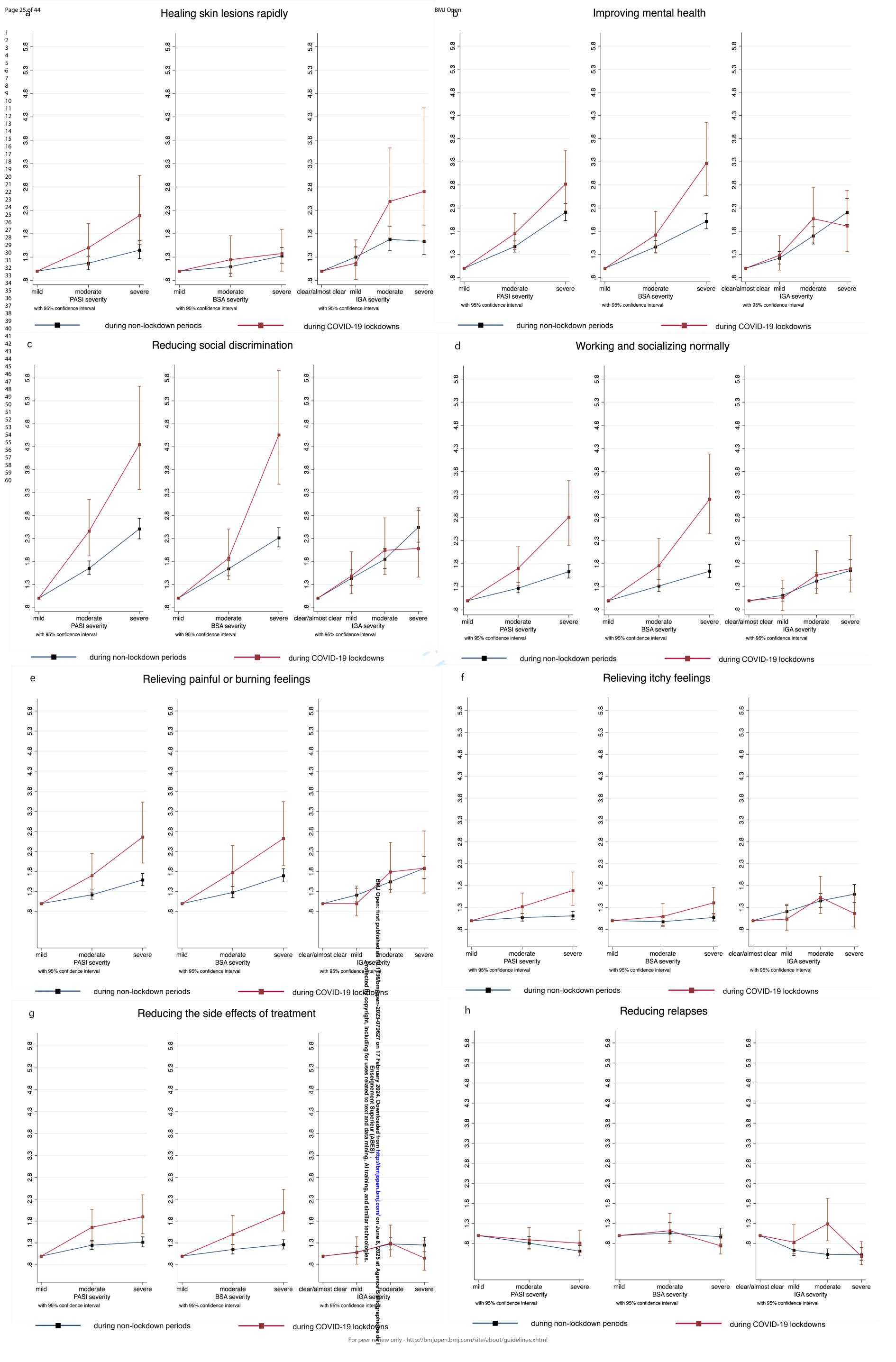
	PASI		BSA d			⊐dga			
	Indirect	Total	Mediated	Indirect	Total	Mediated 💭	ា ខ្លាndirect	Total	Mediated
	effect*	effect [†]	proportion [‡]	effect*	effect [†]	proportio	ageffect*	effect [†]	proportion [‡]
Healing skin lesions rapidly	<0.001	0.001	0.6%	<0.001	0.001	1.4% e		0.019	0.3%
Improving mental health	0.009	0.020	47.1%	0.004	0.007	56.7% d	1 1 1 1 1 1 1 1 1 1	0.186	52.6%
Reducing social discrimination	0.006	0.013	49.0%	0.003	0.005	53.5% ត្	≤ 0 2 0 .064	0.118	54.3%
Working and socializing normally	0.025	0.035	72.1%	0.010	0.015	67.7% ag	b 0.260	0.289	90.0%
Relieving painful or burning feelings	0.010	0.024	40.8%	0.004	0.009	45.5% d	0.102	0.212	48.2%
Relieving itchy feelings	0.011	0.015	73.2%	0.004	0.003	139.4% a	A = 0.106	0.244	43.3%
Reducing the side effects of treatment	0.016	0.021	74.3%	0.006	0.007	83.4% n i	5 0.162	0.145	111.9%
Reducing relapses	<0.001	0.003	7.6%	<0.001	0.001	5.9% 9	0.004	0.079	5.4%
						ne indirect effect and similar te	3	by life qua	lity.
The mediated proportion equals to the ind						ne indirect effect and similar technologies.	ts <mark>omj.com/ on June 8, 2025 at Agence Bibliographique</mark>	by life qua	lity. 2:

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Patient characteristics	Healing skin lesions rapio	lly	Improving mental health		
	OR (95% CI)	P value	OR (95% CI)	P value	
Sex (reference: male)	1.23 (1.11–1.36)	<0.001	1.04 (0.98–1.11)	0.205	
Age	0.994 (0.991–0.998)	0.004	0.993 (0.991–0.996)	<0.001	
Body mass index	0.997 (0.990–1.003)	0.281	0.9955 (0.9914–0.9996)	0.030	
Marriage (reference: unmarried)	0.82 (0.72–0.94)	0.003	1.06 (0.98–1.14)	0.166	
Bachelor's degree	1.01 (0.92–1.12)	0.912	0.90 (0.84–0.95)	0.001	
Unemployment	0.82 (0.70–0.95)	0.010	1.08 (0.98–1.20)	0.112	
Current smoker	1.17 (1.04–1.30)	0.005	0.81 (0.75–0.86)	<0.001	
COVID-19 lockdowns	0.87 (0.77–0.99)	0.037	1.02 (0.93–1.11)	0.726	
Disease course	0.9996 (0.9989–1.0004)	0.319	0.9999 (0.9993–1.0005)	0.744	
Family history	0.93 (0.82–1.05)	0.225	1.03 (0.95–1.11)	0.457	
Psoriasis phenotype (refer	ence: plaque psoriasis)				
Erythrodermic	1.19 (0.76–1.86)	0.435	1.09 (0.84–1.42)	0.503	
psoriasis Pustular psoriasis	1.71 (1.26–2.32)	0.001	0.77 (0.65–0.92)	0.003	
Guttate psoriasis	1.14 (0.9995–1.31)	0.051	0.78 (0.71–0.84)	<0.001	
Arthropathic psoriasis	0.55 (0.47–0.64)	<0.001	1.22 (1.09–1.37)	0.001	
Lesions on specific areas					
Nail	1.28 (1.14–1.44)	<0.001	0.97 (0.90–1.04)	0.373	
Scalp	1.07 (0.97–1.18)	0.158	1.0005 (0.94–1.06)	0.987	
Palmoplantar	0.75 (0.67–0.85)	<0.001	1.09 (1.01–1.18)	0.027	
Genital	0.93 (0.81–1.07)	0.323	1.08 (0.99–1.17)	0.087	
Comorbidity	0.86 (0.76–0.97)	0.018	0.90 (0.83–0.97)	0.012	
Previous use of biologics	0.87 (0.75–1.01)	0.077	1.02 (0.92–1.13)	0.682	

Table 3. Relationship between other patient characteristics and primarytreatment demands identified by the same logistic regression modelsexamining the impact of PASI on treatment demands

OR: odds ratio; and CI, confidence interval.



Article type: Original Article

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Supplemental Material

Table S1. Data preprocessing standards for derived variables and variables with
potential mistaken values
Table S2. Comparison of baseline characteristics between full population and study
population with complete data4
Table S3. Baseline characteristics stratified by treatment demands
Table S4. Mutlivariable logistic regression models examining the impact of PASI on
treatment demands stratified by COVID–19 lockdowns
Table S5. Mutlivariable logistic regression models examining the impact of BSA on
treatment demands stratified by COVID–19 lockdowns12
Table S6. Mutlivariable logistic regression models examining the impact of IGA on
treatment demands stratified by COVID-19 lockdowns14

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Table S1. Data preprocessing standards for derived variables and variables with potential mistaken values

Patient characteristics	Data preprocessing standards
Height	Was treated as a missing value if height<80cm for adult patients
Weight	Was treated as a missing value if weight<25kg for adult patients
Psoriasis duration	The year of enrollment minus the year of diagnosis
Family history	Was treated as a missing value if the patient was unsure about the
	family history
Psoriatic arthritis	Was treated as "yes" if the patient was diagnosed with arthropathic
	psoriasis or psoriatic arthritis
Body Surface Area	Was treated as a missing value if BSA<75% for patients diagnosed with
	erythrodermic psoriasis
	erythrodermic psoriasis

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Table S2. Comparison of baseline characteristics between full population and study

 population with complete data

Patient characteristics	Full population	Study	Missing		
	(n=29 412) ª	population (n=22	number an		
		425)	proportion		
Male, No. (%)	19 120 (65.1)	14 567 (65.0)	53 (0.2)		
Age, median (IQR), y	41 (32–54)	40 (31–54)	241 (0.8)		
BMI, median (IQR), kg/m²	24.0 (21.6–26.6)	24.0 (21.7–26.7)	678 (2.3)		
Unemployment ^b , No. (%)	2544 (11.5)	1994 (11.4)	1019 (3.5)		
Married, No. (%)	22 004 (77.5)	17 204 (76.7)	1018 (3.5)		
Bachelor's degree or higher, No. (%)	9277 (34.5)	7828 (34.9)	2487 (8.5)		
Current smoker, No. (%)	7101 (25.0)	6023 (26.9)	1018 (3.5)		
Enrolled during the COVID–19 lockdowns	4178 (14.3)	2706 (12.1)	159 (0.5)		
Psoriasis duration, median (IQR), y	6 (2–14)	6 (2–14)	27 (0.1)		
Family history, No. (%)	21 924 (16.5)	3816 (17.0)	3166 (10.8		
Psoriasis phenotype, No. (%)					
Plaque psoriasis	24 574 (83.6)	18 231 (81.3)	17 (0.1)		
Erythrodermic psoriasis	376 (1.3)	242 (1.1)			
Pustular psoriasis	968 (3.3)	658 (2.9)			
Guttate psoriasis	3670 (12.5)	3016 (13.4)			
Psoriatic arthritis	2302 (7.8)	1590 (7.1)			
Lesions on special areas, No. (%)					
Nail involvement	6440 (23.1)	5365 (23.9)	1527 (5.2)		
Scalp involvement	18 190 (64.0)	14 578 (65.0)	986 (3.4)		
Palm or/and sole involvement	5705 (20.3)	4458 (19.9)	1288 (4.4)		
Genital involvement	3702 (13.3)	3014 (13.4)	1544 (5.2)		
Disease severity, median (IQR)					
PASI	7.2 (3.0–14.7)	7.2 (3.0–14.6)	507 (1.7)		
BSA	10.0 (3.4–30.0)	10.0 (3.0–30.0)	494 (1.7)		
IGA	3 (2–3)	3 (2–3)	500 (1.7)		
DLQI	8 (3–13)	8 (3–12)	1 261 (4.3)		
Comorbidities No. (%)	4101 (13.9)	3245 (14.5)	2630 (8.9)		
Previous biological treatment ^c , No. (%)	2603 (8.9)	1982 (8.8)	23 (0.1)		
Treatment demands		-	·		
Healing skin lesions rapidly	25 213 (88.8)	20 111 (89.7)	1021 (3.5)		
Improving mental health	10 706 (37.7)	8531 (38.0)			
Reducing social discrimination	8854 (31.2)	7042 (31.4)			
Working and socializing normally	8120 (28.6)	6604 (29.4)			
Relieving painful/ burning feelings	6979 (24.6)	5476 (24.4)			
Relieving itchy feelings	10 668 (37.6)	8549 (38.1)			

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Reducing side effects of treatment	8708 (30.7)	7162 (31.9)	
Reducing relapses	1651 (5.8)	1063 (4.7)	

Abbreviations: BMI, body mass index; PASI, Psoriasis Area and Severity Index; BSA, Body Surface Area; IGA, Investigator's Global Assessment; DLQI, Dermatology Life Quality Index.

^a Totally 29,412 adults were enrolled in the registry by September 2021.

^b Unemployment rate was calculated in the working-age population, which excluded retired patients and students.

[°] Biological treatment included Tumor Necrosis Factor-α Inhibitors and Interleukin Inhibitors.

	Reduc	ing socia	al	Workin	ig and		Relievi	ng painf	Relievi	ng itchy	Bedecing the side Reducing rela							
	discrimination			sociali	zing nor	mally	burnin	g feeling	S	feeling	S		बेfects of treatmen					
	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	ebrua gens u¥es	No	Ρ	Yes	No	
	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val	(<u>8</u> 7∰)	(n=71	val	(n=10	(n=21	
	42)	383)	ue	04)	821)	ue	76)	949)	ue	31)	894)	ue	2024. ang t	26)	ue	63)	362)	
Demographics													으로ㅁ					
Male, n (%)	4664	9903	0.0	4438	10129	<0.	3631	10936	0.0	5506	9061	0.1		10010	0.0	675	13892	
	(66.2)	(64.4)	07	(67.2)	(64.0)	001	(66.3)	(64.5)	16	(64.4)	(65.3)	73		(65.6)	04	(63.5)	(65.0)	
Age,y,median(I	40(31	40(31	0.1	38(30	41(31	<0.	43(32	39(31	<0.	41(32	39(31	<0.	₽ ₽₹3 2	40(31	0.9	39(30	40(31	
QR)	-53)	-54)	21	-51)	-54)	001	-56)	-53)	001	-55)	-52)	001	A BE	-54)	35	-53)	-54)	
BMI,kg/m²,medi	24.1(24.0(0.6	24.2(24.0(<0.	24.1(24.0(0.1	24.2(24.0(0.0	2406	24.0(0.0	23.4(24.1(
an(IQR)	21.9–	21.6–	08	21.9–	21.7–	001	21.9–	21.7–	59	21.8–	21.7–	02	ngvAl vaiptin	21.7–	02	21.3–	21.8–	
	26.7)	26.8)		27.0)	26.7)		26.7)	26.7)		27.0)	26.6)		2 57.0 <u>₹</u>	26.6)		26.0)	26.8)	
Unemployment ^a ,	658	1336	0.1	668	1326	<0.	575	1419	<0.	873	1121	<0.		1254	<0.	85	1909	
n (%)	(9.3)	(8.7)	08	(10.1)	(8.4)	001	(10.5)	(8.4)	001	(10.2)	(8.1)	001	ក្លឹ០.ឆ្នំ	(8.2)	001	(8.0)	(8.9)	
Married, n (%)	5486	11718	0.0	4915	12289	<0.	4419	12785	<0.	6666	10538	<0.	द्ध ें560	11644	0.0	806	16398	
	(77.9)	(76.2)	04	(74.4)	(77.7)	001	(80.7)	(75.4)	001	(78.0)	(75.9)	001	ë 7.8	(76.3)	27	(75.8)	(76.8)	
Bachelor's	2246	5582	<0.	2460	5368	<0.	1546	6282	<0.	2794	5034	<0.	2452	5371	0.1	380	7448	
degree, n (%)	(31.9)	(36.3)	001	(37.3)	(33.9)	001	(28.2)	(37.1)	001	(32.7)	(36.3)	001	64.5g	(35.2)	96	(35.8)	(34.9)	
Current smoker,	1685	4338	<0.	1854	4169	0.0	1447	4576	0.4	2351	3672	0.0	19 55	4068	0.3	259	5764	
n (%)	(23.9)	(28.2)	001	(28.1)	(26.4)	08	(26.4)	(27.0)	05	(27.5)	(26.5)	89	ġ.7.33	(26.7)	10	(24.4)	(27.0)	
COVID–19	889	1817	0.0	799	1907	0.9	647	2059	0.5	1051	1655	0.4	938 🛱	1768	0.0	344	2362	
lockdown, n (%)	(12.6)	(11.8)	83	(12.1)	(12.1)	25	(11.8)	(12.1)	51	(12.3)	(11.9)	13	(13. 6	(11.6)	01	(32.4)	(11.1)	
Duration,y,	8(2–	6(1–	<0.	8(2–	6(1–	<0.	7(2–	6(1–	<0.	6(2–	6(1–	0.9	7(2 – 6	6(1–	<0.	6(2–	6(2–	
median(IQR)	15)	14)	001	15)	14)	001	15)	14)	001	14)	14)	83	15) Bibliographique de l	14)	001	14)	14)	
Continued													liog					

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				Relieving painful orRelieving itchyburning feelingsfeelings						o -	ing the s of treat	Reducing relapses						
	Yes	No	Р	Yes	No	P	Yes	No	P	Yes	No	Р	Ves T	No	P	Yes	No	F
	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val	– 0	(n=71	val	(n=10	(n=21	v
	42)	383)	ue	04)	821)	ue	76)	949)	ue	31)	894)	ue		26)	ue	63)	362)	ι
Family history, n	1100	2716	<0.	1201	2615	0.0	862	2954	0.0	1458	2358	0.9	202 lated	2492	<0.	184	3632	(
(%)	(15.6)	(17.7)	001	(18.2)	(16.5)	03	(15.7)	(17.4)	04	(17.1)	(17.0)	06	ବଞ୍ଚି	(16.3)	001	(17.3)	(17.0)	g
Psoriasis pheno	type⁵, n	(%)											Sul					
Plaque	5934	12297	<0.	5417	12814	0.0	4473	13758	0.3	7016	11215	0.0	ownlead Superieu text and	12408	0.9	929	17302	•
psoriasis	(84.3)	(79.9)	001	(82.0)	(81.0)	71	(81.7)	(81.2)	39	(82.1)	(80.8)	20	(# <u></u> 7,3)	(81.3)	86	(87.4)	(81.0)	(
Erythrodermic	93	149	0.0	120	122	<0.	116	126	<0.	124	118	<0.	from (ABE) ta,Tmii	129	<0.	13	229	(
psoriasis	(1.32)	(0.97)	18	(1.8)	(0.77)	001	(2.1)	(0.7)	001	(1.5)	(0.9)	001	(∄-93)⊇	(0.8)	001	(1.2)	(1.1)	4
Pustular	184	474	0.0	156	502	0.0	230	428	<0.	250	408	0.9	19,89 19,89 19,80	469	0.0	25	633	(
psoriasis	(2.6)	(3.1)	54	(2.4)	(3.2)	01	(4.2)	(2.5)	001	(2.9)	(2.9)	45		(3.1)	73	(2.4)	(3.0)	4
Guttate	735	2281	<0.	809	2207	0.0	533	2483	<0.	1063	1953	<0.		2082	0.2	88	2928	
psoriasis	(10.4)	(14.8)	001	(12.3)	(13.9)	01	(9.7)	(14.6)	001	(12.4)	(14.1)	001	ີ່ 🖞 3.0	(13.6)	20	(8.3)	(13.7)	(
Arthropathic	595	995	<0.	498	1092	0.0	606	984	<0.	631	959	0.1		1054	0.1	60	1530	(
psoriasis	(8.5)	(6.5)	001	(7.5)	(6.9)	89	(11.1)	(5.8)	001	(7.4)	(6.9)	83	(2 .5)	(6.9)	16	(5.6)	(7.2)	(
Lesions on spec	ial areas	s, n (%)											ar					
Nail	1791	3664	0.5	1943	3422	<0.	1548	3817	<0.	2280	3085	<0.		3346	<0.	286	5079	(
involvement	(24.2)	(23.8)	83	(29.4)	(21.6)	001	(28.3)	(22.5)	001	(26.7)	(22.2)	001	28.29	(21.9)	001	(26.9)	(23.8)	2
Scalp	4538	10040	0.2	4662	9916	<0.	3693	10885	<0.	5937	8641	<0.		9567	<0.	694	13884	(
involvement	(64.4)	(65.3)	29	(70.6)	(62.7)	001	(67.4)	(64.2)	001	(69.5)	(62.3)	001	(70.04)	(62.7)	001	(65.3)	(65.0)	4
Palmoplantar	1519	2939	<0.	1482	2976	<0.	1390	3068	<0.	1906	2552	<0.	159 6	2868	<0.	209	4249	(
involvement	(21.6)	(19.1)	001	(22.4)	(18.8)	001	(25.4)	(18.1)	001	(22.3)	(18.4)	001	(22. 2)	(18.8)	001	(19.7)	(19.9)	ł

													796 inc					
		ing socia	al	Working and			Relieving painful or Relieving itchy						0	ing the s	Reducing relapses			
				socializing normally						feelings			effects of treatment					
	Yes	Νο	Р	Yes	Νο	Ρ	Yes	No	Ρ	Yes	Νο	Ρ	Ϋ́es ⁷ Fe	Νο	Ρ	Yes	No	F
	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val		(n=71	val	(n=10	(n=21	V
	42)	383)	ue	04)	821)	ue	76)	949)	ue	31)	894)	ue		26)	ue	63)	362)	ι
Lesions on spe													12024 D gnement lated to					
Genital	1020	1994	0.0	1088	1926	<0.	936	2078	<0.	1403	1611	<0.	5136	1828	<0.	164	2850	C
involvement	(14.5)	(13.0)	02	(16.5)	(12.2)	001	(17.1)	(12.3)	001	(16.4)	(11.6)	001	ୡୄଢ଼ଵୖ	(12.0)	001	(15.4)	(13.3)	5
Disease severit		. ,											o@nloaded : Seperiettr (text and dat					
PASI	9.6	6.0	<0.	9.0	6.4	<0.	9.2	6.4	<0.	7.9	6.6	<0.	egata €ata €ata	6.5	<0.	5.8	7.2	<
	(4.2–	(2.7–	001	(3.7–	(2.8–	001	(3.9–	(2.8–	001	(3.3–	(2.8–	001	from (ABE) tagnii	(2.8–	001	(2.6–	(3.0–	C
	17.4)	13.2)		17.1)	13.5)		18.0)	13.6)		16.1)	13.8)		h Attp://bmjo	13.9)		12.0)	14.7)	
BSA, %	15.0	8.0	<0.	13.0	10.0	<0.	15.0	10.0	<0.	10.0	10.0	<0.	1 0.0	10.0	<0.	9.0	10.0	(
	(5.0–	(3.0–	001	(5.0–	(3.0–	001	(5.0–	(3.0–	001	(3.3–	(3.0–	001		(3.0–	001	(3.0–	(3.0–	8
	31.0)	25.0)		34.0)	25.0)		35.0)	25.0)		30.0)	27.0)		340.0 <u>8</u>	27.0)		30.0)	30.0)	
IGA	3 (2–	2 (2–	<0.	3 (2–	3 (2–	<0.	3 (2–	3 (2–	<0.	3 (2–	3 (2–	<0.	ຊີ (2-	3 (2–	<0.	3 (2–	3 (2–	4
	3)	3)	001	3)	3)	001	3)	3)	001	3)	3)	001	ngoan@sign	3)	001	3)	3)	(
DLQI, median	10(6–	6(2–	<0.	10(6—	6(2–	<0.	10(6—	7(2–	<0.	9(4—	7(2–	<0.		7(2–	<0.	8(3–	8(3–	C
(IQR)	16)	10)	001	17)	11)	001	16)	11)	001	14)	12)	001	nafo) J	11)	001	12)	12)	ę
Comorbidity ^c , n	906	2339	<0.	990	2255	0.0	872	2373	<0.	1404	1841	<0.	leethn	2087	<0.	152	3093	(
(%)	(12.9)	(15.2)	001	(15.0)	(14.3)	03	(15.9)	(14.0)	001	(16.4)	(13.3)	001	6.29	(13.7)	001	(14.3)	(14.5)	g
Previous use of	631	1351	0.6	608	1374	0.2	414	1568	<0.	557	1425	<0.	025 988	1385	0.0	114	1868	(
biologicsd	(9.0)	(8.8)	63	(9.2)	(8.7)	09	(7.6)	(9.3)	001	(6.5)	(10.3)	001	(8.3) ₽	(9.1)	69	(10.7)	(8.7)	2

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Table S4. Mutlivariable logistic	regression models examining the imp	pact of PASI on treatmest demand	s stratified by COVID-19
lockdowns		on 17 Jing f	

Odds ratios (95% Cl)	Without	COVID-19 lock	downs		With CO	Hetero test	Heterogeneity test		
	Mild	Moderate	Severe	Trend Test ^a	Mild	Moderate	wns s m s s s s s s s s s s s s s s s s s	Q	Р
	PASI<3	PASI 3-<10	PASI≥10		PASI<3	PASI 3-<10	PASI≥10 ²⁶ meret tagente	(df)	value
Healing skin lesions	1.0	1.17 (1.03–	1.45 (1.27–	1,02 (1.01–	1.0	1.50 (1.12–	2.19 (1.572) 1.04 (1.02-	- 3.42	0.064
rapidly		1.32)*	1.65)***	1.02)***		2.02)**	3.05)*** and a feet of 1.06)***	(1)	
Improving mental	1.0	1.47 (1.35–	2.21 (2.03–	1.03 (1.02–	1.0	1.75 (1.40–	2.82 (2.24 6 1.04 (1.03-	- 3.44	0.064
health		1.59)***	2.40)***	1.03)***		2.18)***	3.55)*** a a a a a a a a a a a a a a a a a a	(1)	
Reducing social	1.0	1.65 (1.52–	2.51 (2.29–	1.03 (1.02–	1.0	2.46 (1.92–	4.35 (3.3) 1.05 (1.04-	- 12.82	<0.001
discrimination		1.81)***	2.74)***	1.03)***		3.15)***	5.62)*** g 1.06)***	(1)	
Working and	1.0	1.27 (1.17–	1.63 (1.49–	1.02 (1.01–	1.0	1.70 (1.33–	2.81 (2.49-9 1.03 (1.02-	- 9.09	0.003
socializing normally		1.39)***	1.78)***	1.02)***		2.17)***	3.60)*** 📓 😴 1.04)***	(1)	
Relieving painful or	1.0	1.22 (1.11–	1.59 (1.45–	1.02 (1.02–	1.0	1.70 (1.28–	2.66 (291-2 1.04 (1.03-	- 9.74	0.002
burning feelings		1.34)***	1.75)***	1.02)***		2.25)***	3.53)*** a 🛃 1.05)***	(1)	
Relieving itchy	1.0	1.07 (0.99–	1.11 (1.03–	1.01 (1.004–	1.0	1.32 (1.06–	1.69 (1.∰35− <mark>9</mark> 1.02 (1.01-	- 8.27	0.004
feelings		1.16)	1.21)*	1.01)***		1.63)*	2.11)*** 📲 🧣 1.03)***	(1)	
Reducing the side	1.0	1.25 (1.15–	1.32 (1.21–	1.01 (1.01–	1.0	1.66 (1.33–	1.90 (1.81-5 1.02 (1.01-	- 2.44	0.118
effects of treatment		1.36)***	1.44)***	1.01)***		2.07)***	2.40)*** 10 (a 1.03)***	(1)	
Reducing relapses	1.0	0.81 (0.67–	0.61 (0.49–	0.98 (0.98–	1.0	0.89 (0.66–	0.81 (0.997-	- 10.88	0.001
		0.97)*	0.75)***	0.99)***		1.20)	1.12) ^v at 1.02)	(1)	

Abbreviations: PASI, Psoriasis Area and Severity Index. All the models adjusted for sex, age, BMI, marriage, education, smoke, disease course, family history, disease phenotype, whether special areas were affected, comorbidities, and previous treatment, stratified by whether was enrolled during the COVID pandemic. ^aPASI was treated as a continuous variable in the trend test. *Significant at *P*<0.050; **Significant at *P*<0.010; ***Significant at *P*<.001. 10 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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 Table S5. Mutlivariable logistic regression models examining the impact of BSA on treatment demands stratified by COVID–19 lockdowns

Odds ratios (95% CI)	Without C	OVID-19	9 lockd	owns		With CC	OVID–19 lockdo	Februar Ensei or uses r		Heter y test	ogeneit
	Mild	Modera	ate	Severe	Trend Test ^a	Mild	Moderate	Severe 2	Trend Test	Q	Р
	BSA<3%	BSA <10%	3-	BSA≥10%		BSA<3%	BSA 3– <10%	BSALto te		(df)	value
Healing skin lesions	1.0	1.10 ((0.96–	1.33 (1.17–	1.01 (1.01–	1.0	1.25 (0.88–	1.38 a to 399–	1.01 (1.001–	0.19	0.663
apidly		1.26)		1.50)***	1.01)***		1.76)	1.89 6 e	1.01)*	(1)	
mproving mental	1.0	1.46 ((1.33–	2.01 (1.85–	1.01 (1.01–	1.0	1.72 (1.33–	3.27 1 2 57-	1.02 (1.01–	22.0	<0.001
nealth		1.60)***		2.19)***	1.01)***		2.23)***	4.15 ES	1.02)***	1 (1)	
Reducing social	1.0	1.64 ((1.48–	2.32 (2.12–	1.01 (1.01–	1.0	1.87 (1.40–	4.56 . (\$ 48–	1.02 (1.02–	37.0	<0.001
discrimination		1.81)***		2.54)***	1.01)***		2.51)***	5.97 🏝 🖥	1.03)***	8 (1)	
Vorking and	1.0	1.32 ((1.19–	1.64 (1.50–	1.01 (1.01–	1.0	1.76 (1.32–	3.20 a. (\$ 45-	1.02 (1.01–	13.2	<0.001
ocializing normally		1.45)***		1.79)***	1.01)***		2.35)***	4.18 4	1.02)***	5 (1)	
elieving painful or	1.0	1.28 ((1.15–	1.70 (1.54–	1.01 (1.01–	1.0	1.78 (1.29–	2.62 n (1.94–	1.01 (1.01–	3.84	0.050
ourning feelings		1.42)***		1.87)***	1.01)***		2.45)***	3.54 🖉	1.02)***	(1)	
Relieving itchy	1.0	0.98 ((0.89–	1.07 (0.99–	1.001 (0.999–	1.0	1.10 (0.86–	1.41 🚉 (19.13-	1.01 (1.004–	11.3	0.001
eelings		1.07)		1.16)	1.002)		1.39)	1.76 g L	1.01)***	4 (1)	
Reducing the side	1.0	1.15 ((1.05–	1.26 (1.16–	1.003 (1.002–	1.0	1.50 (1.16–	1.99 0 (57-	1.01 (1.003–	3.66	0.056
effects of treatment		1.26)**		1.37)***	1.005)***		1.93)**	2.52	1.01)***	(1)	
Reducing relapses	1.0	1.06 ((0.85–	0.97 (0.79–	0.997 (0.99–	1.0	1.12 (0.81–	0.74 % (054–	0.996 (0.99–	0.07	0.785
		1.32)		1.18)	1.001)		1.55)	1.02) A	1.003)	(1)	

Page 37 of 44					BMJ Ope	'n		njopen-2023-0 d by copyright,				
1 2 3 Table 5 lockdo	S6. Mut owns	livariable logi	stic regressio	on models exa	amining the i	mpact of	IGA on trea	<u> </u>	nds stratified	by COVID–1	9	
7Odds ratios (95% ⁸ Cl)	Without	COVID–19 locko	downs			With CO	VID–19 lockdov	Februa or uses			Heter ty tes	ogenei t
9 10	Almost	Mild	Moderate	Severe	Trend Test	Almost	Mild	ModeBake	Severe	Trend Test	Q	<u>.</u> Р
11	clear	IGA=2	IGA=3	IGA=4		clear	IGA=2		IGA=4		(df)	value
12 13	IGA=0/1					IGA=0/1		ont S te				
1娟ealing skin	1.0	1.30 (1.12–	1.68 (1.44–	1.64 (1.35–	1.21 (1.14–	1.0	1.17 (0.82–	2.49 j () 2.49 j	2.70 (1.63–	1.49 (1.30–	7.75	0.005
¹ besions rapidly		1.52)**	1.96)***	1.99)***	1.27)***		1.67)	3.64 and a	4.49)***	1.71)***	(1)	
16 ₁ Improving mental	1.0	1.22 (1.09–	1.70 (1.52–	2.21 (1.94–	1.30 (1.26–	1.0	1.28 (0.96–	2.0 2 2 57-	1.91 (1.36–	1.30 (1.18–	<0.0	0.971
1 8 ealth		1.36)***	1.90)***	2.51)***	1.35)***		1.70)	2.74 HIS	2.68)***	1.43)***	1 (1)	
¹ Reducing social	1.0	1.43 (1.27–	1.85 (1.64–	2.55 (2.22–	1.32 (1.28–	1.0	1.48 (1.10–	2.0 4 (1 52–	2.08 (1.46–	1.29 (1.17–	0.21	0.646
20 ₂ discrimination		1.61)***	2.08)***	2.92)***	1.37)***		2.01)*	2.75 ² *** 🖥	2.97)***	1.43)***	(1)	
2 ¹² Vorking and	1.0	1.12 (0.99–	1.43 (1.27–	1.65 (1.45–	1.19 (1.14–	1.0	1.06 (0.78–	1.5 £ . (§ :16–	1.69 (1.19–	1.24 (1.12–	0.54	0.461
²³ socializing normally 24		1.26)	1.60)***	1.89)***	1.23)***		1.44)	2.09	2.41)**	1.37)***	(1)	
²⁴ ₂ Relieving painful or	1.0	1.21 (1.06–	1.54 (1.36–	1.88 (1.62–	1.23 (1.18–	1.0	1.00 (0.69–	1.79 (2.27-	1.88 (1.26–	1.32 (1.18–	1.29	0.256
26 urning feelings		1.38)**	1.76)***	2.18)***	1.28)***		1.44)	2.53 4	2.81)**	1.48)***	(1)	
²⁷ Relieving itchy	1.0	1.21 (1.08–	1.45 (1.30–	1.61 (1.41–	1.17 (1.13–	1.0	1.04 (0.78–	1.53 (b .16–	1.16 (0.83–	1.13 (1.03–	0.38	0.539
26 2fgelings		1.35)**	1.62)***	1.83)***	1.21)***		1.37)	2.01 g ** L	1.63)	1.24)*	(1)	
³ Reducing the side	1.0	1.09 (0.97–	1.28 (1.14–	1.25 (1.10–	1.09 (1.05–	1.0	1.08 (0.82–	1.300 (00.98–	0.96 (0.69–	1.02 (0.93–	1.37	0.241
³¹ effects of treatment		1.22)	1.43)***	1.43)**	1.13)***		1.44)	1.700 202	1.35)	1.13)*	(1)	
38 educing relapses	1.0	0.63 (0.50–	0.53 (0.42–	0.52 (0.39–	0.79 (0.73–	1.0	0.83 (0.55–	1.29% (8.87–	0.48 (0.27–	0.98 (0.85–	5.86	0.016
34		0.79)***	0.67)***	0.70)***	0.87)***		1.27)	1.92) 🛱	0.85)*	1.13)*	(1)	
35 36 Abbrevia	tions: IGA, Inv	vestigator's Global A	Assessment. All the	models adjusted for	r sex, age, BMI, ma	rriage, educat	tion, smoke, diseas	e course, fa g ily his	tory, disease pheno	otype, whether spec	ial	
37 areas we	re affected, co	omorbidities, and pre	evious treatment, stra	atified by whether wa	as enrolled during th	e COVID pan	demic.	e Bibl				
38 *Significa 39	ant at <i>P</i> <0.050); **Significant at <i>P</i> <0	0.010; ***Significant	at <i>P</i> <.001				blio				
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STROBE St	ateme	nt—checklist of items that s	hould l	BMJ Open BMJ Open P be included in reports of observational studies
	Item No.	Recommendation	Page No.	Relevant text from manuseript
Title and abstract	1	(<i>a</i>) Indicate the study's design with a commonly used term in the title or the abstract	1	Enhanced impact of psoriasis severity on treatment demands of patients during the COVID-19 pandemic: A cross- sectional study based on a national psoriasis registry in China
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3	Objectives: The personalized treatment demands of patients with pandemic lockdown. This study aimed to investigate the treatment demands of patients with psoriasis with different severities, stratified by COVID-19 pandemic conditions. Design: Cross-sectional study design.
				Setting: Multicenter study based on a national psoriasis registry in the field. Participants: A total of 22,425 adult patients with psoriasis were the field between August 2020 and September 202 Primary and Secondary Outcome Measures: The primary outcome overe patient demands for quick healing of skillesions and improving mental health, which were collected by question over the impact of disease severity, as measured by Psoriasia Area and Severity Index (PASI), Body Surface Area (BSA), and Investigator's Global Assessment (IGA), on treatment demands, as stratified by COVID-19 panden conditions (lockdown vs. non-lockdown). Results: Increasing PASI score significantly increased patient demands for rapid healing of skin lesions and improving mental health during non-lockdown periods. The magnitude of both associations further increased during the COVID 19 lockdown from an odds ratio (OR) of 1.45 (95% confidence interval CI] 1.27–1.65) to 2.19 (95% CI 1.57–3.05) and 2.11 (95% CI 2.03–2.40) to 2.81 (95% CI 2.24–3.55), respectively. The skin lesion healing demand was more triggered by the overall irritation level (measured by IGA, OR=1.67, 95% CI 1.35–1.99 during non-lockdown period versus OR=2.70, 95% CI 1.63–4.49 during lockdowns); while the menal health improving demand was more triggered by lesion coverage (measured by BSA, OR=2.01, 95% CI 1.88–2.19 versus OR=3.27, 95% CI 2.57–4.15). Conclusions: Psoriasis aggravation significantly increased patients treatment demands, especially during lockdowns. The used psoriasis severity measures highlighted patients treatment demands differently. This suggests more accessible and personalized healthcare for patients with psoresis should be available during future pandemics.
Introduction Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5	Psoriasis is a chronic, non-fatal disease primarily affecting the sking. The prevalence of psoriasis varies geographicall with 0.14% and 1.99% of the population in East Asia and Australasia being affected, respectively [1]. In China, the prevalence was 0.12% in 1987 and 0.47% in 2012 [2]. Apart from sking esions, psoriasis is also now recognized as a systemic inflammatory disorder that relates to various comorbidities, such as metabolic syndrome, arthritis, malignancy, and so on [3]. Poor appearances, together with comorbidities, significantly impair patients' daily functioning and cause significant psychological distress [4], which can essue in depression, suicidal ideation, and substance abuse [5,6], causing high social burdens, especially during the recurrent coronavirus disease 2019 (COVIE 19) pandemics [7,8].
				Current clinical diagnosis and treatment for psoriasis must follow apprepriate guidelines and consensus. Therefore, t

ge 39 of 44				BMJ Open BMJ Open BMJ Open
				pyrigh
				choice of treatment for psoriasis primarily depends on the objective assessment of lesion severity of the disease, yet the demands of the patient are often neglected [9,10]. However, due to the garonic, non-fatal characteristics of psoriasis, individual perceptions of the disease can determine the impact of provide is on the quality of life of patients, which may then affect their treatment demands [11,12]. Thus, the treatment defisions should be driven by the real needs and expectations of each individual.
				Furthermore, since healthcare access (e.g. emerged telemedicine) [5] mb], as well as the clinicians' treatment considerations to control psoriasis, have all changed during the recurrent COVID-19 pandemics [17], patients' perception of psoriasis and further their treatment demands may all caccordingly. From a healthcare-seeking behavior perspective, common changes among patients with psoria coviding the COVID-19 pandemic included the canceling or deferring of appointments, nonadherence to treatment for more any line of prescription, and treatment-change requirements [7,18]. Patients may become more anxious about the province of prescription, and treatment-change healthcare. In contrast, from a quality of life perspective, the social activity aspect assessed in a quality of life questionnaire became irrelevant during lockdown, which led to part their psoriasis lesions as more acceptable because they are less worried about skin lesion appearances due to the social activities, and are more fearful of COVID-19 than non-fatal psoriasis. As a result, how patients' treatment demands changed during pandemics remains unknown. Thus, it is essential to re-assess patients' treatment demands from patients' perspectives during pandemics are limited.
Objectives	3	State specific objectives, including any prespecified hypotheses	5	This study examined the treatment demands of patients with varying segerities of psoriasis in the setting of recurrent COVID-19 lockdowns, hoping to provide references for personalized treatment during these periods, as for patients with other chronic diseases in future lockdowns.
Methods				ġ ž
Study design	4	Present key elements of study design early in the paper	5	Study Design, Patients, and Data Collected This cross-sectional, multicenter study was based on a nationwide data collection platform established by the Psoriasis Standardized Diagnosis and Treatment Center and led by the National Clinical Research Center for Skin and Immune Disease
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6	Study Design, Patients, and Data Collected This cross-sectional, multicenter study was based on a nationwide and collection platform established by the Psoriasis Standardized Diagnosis and Treatment Center and led by the National Chinical Research Center for Skin and Immune Disease. ^{20,21} The platform is the first and largest psoriasis registry China, and as of September 2021, had included data of 32 014 patients with psoriasis from 228 hospitals. The registry Clina, and as of Memory, clinical assessment, previous and current treatments for psoriasis, self-apported life quality, and treatment demands at enrollment. All patients provided informed consent for publication before their details were entered into the registry. The registry was approved by the Human Genetic Resources Management Office of the Ministry of Science and Technology of China (2022-CJ0021) and the ethics committee of Peking University First Hospital (2020-scientific research-255) for use in clinical studies. The data preprocessing standards for derived variables and variables with potential mistaken values are listed in Table S1 (see Supplemental Material).
Participants	6	(<i>a</i>) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of	(a) 6	All patients aged ≥ 18 years enrolled between August 2020 and September 2021 with complete baseline data were included. The differences in baseline characteristics between patients with complete and incomplete data are shown in Table S2 (see Supplemental Material).
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Page	40	of	44
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		selection of participants. Describe methods of follow- up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of centrals par easo			079627 on 17 February 2024. Downloa
Variables	7	number of controls per case Clearly define all outcomes, 6 exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Study Measures Treatment demands were collected using multiple choice que healing skin lesions rapidly and improving mental health. Oth discrimination; normal work and socializing; relieving itchin and disease relapses. Life quality was assessed using the Der Psoriasis severity was assessed using the Psoriasis Area and S 5-point Investigator's Global Assessment (IGA). ^{9,10} Accordir psoriasis in China (2018), PASI score was categorized as mil percentages were categorized as mild (<3%), moderate (3%– severity as clear/almost clear (0/1), mild (2), moderate (3), ar Provincial COVID-19 data was summarized from the official People's Republic of China (http://www.nhc.gov.cn/xcs/ydb both epidemic control measures and public response to the pa were furtherclassified into the same pandemic period. The CO according to the geographical location and enrolled day of ea	stion aire ner deanant ess, pans, matolegy Severity Ir g to fee g d (<3 mod <10% and d sewere (websete o /list_gzbd undemic, to DVID-19 j	containing two primary treatment demands: were included, such as reducing social or burning; and reducing treatment side effect bife Quality Index (DLQI). Network (PASI), Body Surface Area (BSA), and the idelines for the diagnosis and treatment of lerate (3–<10) and severe (\geq 10), while BSA severe (\geq 10%). ²² The 5-point IGA categorize bit the National Health Commission of the html). Considering the maintenance period of the 7 days following the last day with a new ca andemic variable was treated as binary
Data sources/ measuremen t	8*	For each variable of interest, 6- give sources of data and details of methods of assessment (measurement).		stionnaire her deman	b b b c c c c c c c c c c

1 of 44				BMJ Open Co S
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		Describe comparability of assessment methods if there is more than one group		and disease relapses. Life quality was assessed using the Dermatology of the Quality Index (DLQI). Psoriasis severity was assessed using the Psoriasis Area and Severey Index (PASI), Body Surface Area (BSA), and 5-point Investigator's Global Assessment (IGA). ^{9,10} According to the goldelines for the diagnosis and treatment of psoriasis in China (2018), PASI score was categorized as mild (<3) moderate (3–<10) and severe (≥10), while BSA percentages were categorized as mild (<3%), moderate (3%–<10%) and severe (≥10%). ²² The 5-point IGA categoriz severity as clear/almost clear (0/1), mild (2), moderate (3), and severe (∂). Provincial COVID-19 data was summarized from the official webster the National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/yqtb/list_szada.html). Considering the maintenance period both epidemic control measures and public response to the pandenate the 7 days following the last day with a new c were furtherclassified into the same pandemic period. The COVIDel and the geographical location and enrolled day of each parent.
Bias	9	Describe any efforts to address potential sources of bias	7	Multivariable logistic regression models were used to investigate the models by PASI/BSA/IGA) on each treatment demand, stratified by whether the patient was enrolled during the COVID-19 lockdown. To reduce potential confounding, all models were adjusted for demographic characteristics (sex, age, BM marriage, education, employment, and smoking) and clinical characteristics (psoriasis duration, family history, disea phenotype, nail/scalp/genital/palmoplantar involvement, comorbiding, and previous treatment).
Study size	10	Explain how the study size was arrived at	5-6	The platform is the first and largest psoriasis registry in China, and and September 2021, had included data of 32 0 patients with psoriasis from 228 hospitals. All patients aged ≥18 years enrolled between August 2020 and September 2021 with complete baseline data were included.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6	According to the guidelines for the diagnosis and treatment of psofasis in China (2018), PASI score was categorized as mild (<3), moderate (3–<10) and severe (\geq 10), while BSA percentages were categorized as mild (<3%), moderate (3%–<10%) and severe (\geq 10%). ²² The 5-point IGA categorized segerity as clear/almost clear (0/1), mild (2), moderate (3), and severe (4). Provincial COVID-19 data was summarized from the official website of the National Health Commission of the People's Republic of China (<u>http://www.nhc.gov.cn/xcs/yqtb/list_gabdehtml</u>). Considering the maintenance period both epidemic control measures and public response to the pandemic, the 7 days following the last day with a new c were furtherclassified into the same pandemic period. The COVID 19 pandemic variable was treated as binary according to the geographical location and enrolled day of each pagent Continuous and categorized PASI, BSA, and IGA values were separately modeled in relation to each treatment demand.
Statistical methods	12	(<i>a</i>) Describe all statistical methods, including those used to control for confounding	7	To reduce potential confounding, all models were adjusted for der bgræhic characteristics (sex, age, BMI, marriage education, employment, and smoking) and clinical characteristics (psorasis duration, family history, disease phenotype, nail/scalp/genital/palmoplantar involvement, comorbidities, and previous treatment).
		(b) Describe any methods used to examine subgroups and interactions	7	A Q-test attached to the fixed effect model was performed to detect he progeneity between the impact of psoriasis severity on treatment demands during the COVID-19 pandemic and a period.
		(c) Explain how missing data were addressed	6	All patients aged ≥ 18 years enrolled between August 2020 and Septem E er 2021 with complete baseline data were included. The differences in baseline characteristics between patients with complete and incomplete data are shown Table S2 (see Supplemental Material).
		(d) Cohort study—If	N/A	N/A G

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		applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy		079627 on 17 February 202 Enseignen , including for uses relate
		(<u>e</u>) Describe any sensitivity analyses	N/A	N/A to the point of the point o
		allalyses	\bigcirc	승규는 그는 것을 하는 것을 수 있다. 물건을 하는 것을 수 있는 않았다. 않은 것을 것 않았다. 않았다. 않았는 것 않았는 것 않았다. 않았는 것 않았는 않았다. 않았는 않았는 않았다. 않았는 않았는 않았는 않았다. 않았는 않았는 않았는 않았는 않았다. 않았는 않았는 않았다. 않았는 않았는 않았는 않았다. 않았는 않았는 않았다. 않았는 않 않았다. 않 않았다. 않았는 않 않았는 않 않았다. 않 않았다. 않았는 않 않았다. 않 않았다. 않았다. 않 않았다. 않았
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7	All patients aged ≥18 years enrolled between August 2020 and September 2021 with complete baseline data were included. The differences in baseline characteristics between patients with complete and incomplete data are shown in Table S2 (see Supplemental Material). Among the 29 412 adult patients enrolled as of September 2021 (Table S2; see Supplemental Material), 22 425 with complete baseline information from 212 tertiary hospitals across Careford are shown in the second s
		(b) Give reasons for non- participation at each stage(c) Consider use of a flow	N/A N/A	N/A ning N/A a
		diagram		nd 🗧
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7	Exactly 65.0% were male (n = 14 567). The median age was 40 (I(\Re R: \Re I-54) years, and the percentages of different age groups were as follows: 18–45 years, 60.3% (n = 13 515); 46– \Re O years, 26.9% (n = 6033); ≥61 years, 12.8% (n = 2877). The median PASI and DLQI scores were 7.2 and 8, respectively. Exactly 12.1% (n = 2706) were enrolled during a COVID-19 lockdown.
		(b) Indicate number of participants with missing data for each variable of interest	6	The differences in baseline characteristics between patients with complete and incomplete data are shown in Table S (see Supplemental Material).
		follow-up time (eg, average and total amount)	N/A	N/A Agen
Outcome data	15*	Cohort study—Report numbers of outcome events or summary measures over time Case-control study—Report		e Bibliograph
		numbers in each exposure		

Page 43 of	f 44			BMJ Open BMJ Open
1			category, or summary measures of exposure Cross-sectional study—Report numbers of outcome events or summary measures	Moreover, 89.7% (n = 20 111) and 38.0% (n = 8531) of the patient deplanded rapid healing of skin lesions and mental health improvement, respectively (Table 1).
7 1 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42	Main results	16	(<i>a</i>) Give unadjusted estimates and, if applicable, confounder- adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	To reduce potential confounding, all models were adjusted for denger thic characteristics (sex, age, BMI, marriage, education, employment, and smoking) and clinical characteristics of paiss duration, family history, disease phenotype, nail/scalp/genital/palmoplantar involvement, comorbidities and previous treatment). Multivariable logistic regression and trend tests confirmed that increasing psoriasis severity (measured by PASI) significantly stimulated patients' primary treatment demands of radiation in the context of CI 1.10–1.02 in the trend test, both $P < 0.001$ and improving mental health (OR 2.21, 95% CI 2.2000 for severe PASI versus mild PASI and OR 1.03, 95% CI 1.02–1.03 in the trend test, both $P < 0.001$ and improving mental health (OR 2.21, 95% CI 1.57, discor severe PASI versus mild PASI and OR 1.03, 95% CI 1.02–1.03 in the trend test, both $P < 0.001$ and improving mental health (OR 2.2.9, 95% CI 2.24–3.55 for severe PASI versus mild PASI, despite statistical insignificance (both $P = 0.064$ in the heterogeneity O-test) (Figure 2.11, 0.21, other thement demands, including reducing social discrimination, working and socializing and ultry relieving pain, burning, or itching, and reducing treatment is de effects, were significantly stimulated by description of NASI (all $P < 0.051$, and the degree of stimulation further magnified during the QO ID-19 lockdowns (Fagure S1a, ese Supplemental Material). The exception was the demand for reducing regises, which significantly declined as PASI increased. Still, the magnitude of this decline decreased during the QO ID-19 pandemic (OR 0.61, 95% CI 0.49–0.75 for severe PASI versus mild PASI and OR 0.81, 95% CI 0.49–0.75 for severe PASI versus mild PASI during a non-COVIDI-19 period green of NaSI on the treatment demands mainly by deteriorating life quality, including anon-COVIDI-19 period green of NaSI on the treatment demands of reducing and the degree of NSI or tertheres (OR 0.19, 95% CI 0.49–0.75 for severe PASI versus mild PASI during a non-COVIDI-19 peri
43 44 45			For peer 1	review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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24

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				(OR 1.09; 95% CI 1.01–1.18). However, this was lower in p higher BMI (OR 0.995; 95% CI 0.991–1.000), college educa 95% CI 0.75–0.86), pustular psoriasis (OR 0.77; 95% CI 0.6	atients with ation (OR 0 5-0.9 a an	90; 95% CI 0.84–0.95), smoking (OR 0.81; comorbidities (OR 0.90; 95% CI 0.83–0.97)
		(<i>b</i>) Report category boundaries when continuous variables were categorized	6	According to the guidelines for the diagnosis and treatment of as mild (<3), moderate (3–<10) and severe (\geq 10), while BSA (3%–<10%) and severe (\geq 10%). ²² The 5-point IGA categori (3), and severe (4).	A percentag	s were categorized as mild ($<3\%$), moderate
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A	N/A	Enseignemen uses related to	Jarv 2024. [
Other analyses	17	Report other analyses done- eg analyses of subgroups and interactions, and sensitivity analyses	8-9 subg roup anal yses	Multivariable logistic regression and trend tests confirmed th significantly stimulated patients' primary treatment demands confidence interval [CI] 1.27–1.65 for severe PASI versus m both $P < 0.001$) and improving mental health (OR 2.21, 95% 1.03, 95% CI 1.02–1.03 in the trend test, both $P < 0.001$) du S4; see Supplemental Material). Disease severity-triggered t lockdowns, including rapid lesion healing (OR 2.19, 95% CI 2.24–3.55 for insignificance (both $P = 0.064$ in the heterogeneity Q-test) (10)	hat incession s of range to hild PASE 6 CI 2.43 ring not reat reatment of I 1.57-7.59 or sever Pase	sion healing (odds ratio [OR] 1.45, 95% d OR 1.02, 95% CI 1.01–1.02 in the trend te 40 for severe PASI versus mild PASI and OI periods without COVID-19 lockdowns (Tab mands further increased during COVID-19 for severe PASI versus mild PASI, $P < 0.001$ SI versus mild PASI), despite statistical
Key results	18	Summarise key results with reference to study objectives	10	In this cross-sectional study, it was observed that patient der significantly increased as psoriasis worsened, especially dur measures have different emphases in reflecting patients' trea pandemic. The impact of disease severity on most treatment except for the demands of rapid skin healing and relapse red treatment demands were also examined.	ing the CO timent dem demainds v	VID-19 pandemic. Different psoriasis severity onds, which were magnified during the ras mediated by deteriorated quality of life,
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12- 13	our study was not free from limitations. First, the Psoriasis C dermatological clinics, and a certain proportion of patients d represent the general psoriatic population. Second, there was missing rate was not high and missing at random was consid case analysis was used and considered to sufficiently handle not collected, the COVID-19 pandemic information was mar lockdown was administrated with a precise approach in Chin	ecline enrissing d s missing d lered (Eabl missing da tched to ea na.	Billment. Thus, the study population may not the within this platform. However, as the S2; see Supplemental Material), a complete the study of the study of the study of the study of the study of the study of the study of the study of the study of the study of the s
Interpretatio n	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13	An increase in psoriasis severity significantly stimulates pati- improving mental health, especially during the pandemic loc patients with psoriasis getting more intensive treatment and recognize and meet patients' treatment demands during the p needs of patients, while IGA should be used to reflect the de clinical patient characteristics should further be considered f Moreover, because the COVID-19 lockdown restrictions has	ckdowns, ir mental sup bandemic, sire to quig or more pe	Ricating the need for an accessible pathway for bort during future pandemics. To better be suggest BSA to determine the psychologic ry heal lesions. Other demographic and sonalized treatment during future pandemics.

Page 45 of 44				BMJ Open	d by copyrigh		
1 2 3 Generalisabi 4 lity 5	21	Discuss the generalisability (external validity) of the study results	13	provide guidance for personalized treatment in patients with Moreover, because the COVID-19 lockdown restrictions has provide guidance for personalized treatment in patients with	h non-fài ave been h non-fai	al c rele	gronic diseases in future pandemic lockdowns. Besed in many countries, our findings could
6 Other inform 7 Funding 8 9 10 11	nation 22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14	Funding Source: This study was supported by the Project Treatment, which was funded by PKU-Baidu Fund (referen	g for essert		form for Skin Disease Diagnosis and 020BD012).
12 13 14 *Give inform 15 16	ation se		ase-coi	trol studies and, if applicable, for exposed and unexposed gro	oups in and c	nt Superieu	and cross-sectional studies.
18 checklist is b	est used	in conjunction with this article (fr	eely ava	ecklist item and gives methodological background and public ilable on the Web sites of PLoS Medicine at http://www.plos m.com/). Information on the STROBE Initiative is available a	medicing	B隆S)tr	/, Annals of Internal Medicine at e-statement.org.
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Original Research

Enhanced impact of psoriasis severity on the treatment demands of patients during the COVID-19 pandemic: A cross-sectional study based on a national psoriasis registry in China

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1 Abstract

Objectives: The personalized treatment demands of patients with psoriasis did not get
 significant attention during the pandemic lockdown. This study aimed to investigate the
 treatment demands of patients with psoriasis with different severities, stratified by COVID-19
 pandemic conditions.

Design: Cross-sectional study design.

Setting: Multicenter study based on a national psoriasis registry in China.

8 Participants: A total of 22,425 adult patients with psoriasis were enrolled between August
9 2020 and September 2021.

Primary and Secondary Outcome Measures: The primary outcomes were patient demands for quick healing of skin lesions and improving mental health, which were collected by questionnaires. Multivariable logistic models were used to examine the impact of disease severity, as measured by Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA), and Investigator's Global Assessment (IGA), on treatment demands, as stratified by COVID-19 pandemic conditions (lockdown vs. non-lockdown).

Results: Increasing PASI score significantly increased patient demands for rapid healing of skin lesions and improving mental health during non-lockdown periods. The magnitude of both associations further increased during the COVID-19 lockdown from an odds ratio (OR) of 1.45 (95% confidence interval (CI) 1.27-1.65) to 2.19 (95% CI 1.57-3.05) and 2.11 (95% CI 2.03–2.40) to 2.82 (95% CI 2.24–3.55), respectively. The skin lesion healing demand was more triggered by the overall irritation level (measured by IGA, OR=1.64, 95% CI 1.35–1.99 during non-lockdown periods versus OR=2.70, 95% CI 1.63-4.49 during lockdowns); while the mental health improving demand was more triggered by lesion coverage (measured by BSA, OR=2.01, 95% CI 1.85–2.19 versus OR=3.27, 95% CI 2.57–4.15).

Conclusions: Psoriasis aggravation significantly increased patients' treatment demands,
 especially during lockdowns. The used psoriasis severity measures highlighted patients'
 treatment demands differently. This suggests more accessible and personalized healthcare
 for patients with psoriasis should be available during future pandemics.

29 Strengths and limitations of this study

- This is, to date, the largest study investigating the association between psoriasis
 severity and treatment demands from the patients' perspective, and the first study
 comparing the aforementioned association between a lockdown and a non-lockdown
 period.
- Disease severity was assessed with different measures and from different aspects,
 making the results comprehensive and robust.
- Subjects who participated in our program were enrolled from specific dermatological
 clinics, and thus may not represent the general psoriasis population.
- The demand for improving mental health was collected as a binary variable without
 professional psychological assessment.
- 41 INTRODUCTION

Psoriasis is a chronic, non-fatal disease primarily affecting the skin. The prevalence of psoriasis varies geographically, with 0.14% and 1.99% of the population in East Asia and Australasia being affected, respectively.(1) In China, the prevalence was 0.12% in 1987 and 0.47% in 2012.(2) Apart from skin lesions, psoriasis is also now recognized as a systemic inflammatory disorder that relates to various comorbidities, such as metabolic syndrome, arthritis, malignancy, and so on.(3) Poor appearances, together with comorbidities, significantly impair patients' daily functioning and cause significant psychological distress,(4) which can result in depression, suicidal ideation, and substance abuse, (5-8) causing high social burdens, especially during the recurrent coronavirus disease 2019 (COVID-19) pandemics.(9-11)

Current clinical diagnosis and treatment for psoriasis must follow appropriate guidelines and
 consensus. Therefore, the choice of treatment for psoriasis primarily depends on the
 objective assessment of lesion severity of the disease, yet the demands of the patient are
 often neglected.(12,13) However, due to the chronic, non-fatal characteristics of psoriasis,
 individual perceptions of the disease can determine the impact of psoriasis on the quality of
 life of patients, which may then affect their treatment demands.(14,15) Thus, the treatment
 decisions should be driven by the real needs and expectations of each individual.

Furthermore, since healthcare access (e.g. emerged telemedicine),(16-19) as well as the
clinicians' treatment considerations to control psoriasis, have all changed during the

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recurrent COVID-19 pandemics, (20) patients' mental health condition, their perception of psoriasis and further treatment demands may altered accordingly.(21-23) From the treatment-decision aspect, the initiation of biologics for psoriasis decreased sharply during the COVID-19 pandemic, possibly due to the poor access to healthcare for patients and the lack of evidence on the relationship between COVID-19 infection and biological therapies for psoriasis at the beginning of the pandemic.(24,25) From a healthcare-seeking behavior perspective, patients with psoriasis tended to cancel or defer their appointments, lose adherence to treatment, and require prolonged prescription or treatment-change during the COVID-19 pandemic.(9,26-28) All the above changes may be associated with deterioration of psoriasis and further symptoms of anxiety and depression, (11,22,29,30) although the association is complex and undetermined.(10.27) In contrast, from a guality of life perspective, the social-activity aspect assessed in a quality of life questionnaire became irrelevant during lockdown, which led to paradoxically improved quality of life among patients with psoriasis during the COVID-19 lockdown. (10,31) Patients may perceive their psoriasis lesions as more acceptable because they are less worried about skin lesion appearances due to restricted social activities, and are more fearful of COVID-19 when receiving immunosuppressive treatment for psoriasis.(32) As a result, how patients' treatment demands changed during pandemics remains unknown. Thus, it is essential to re-assess patients' treatment demands to improve personalized treatment during the pandemic. However, studies on changes in treatment demands from patients' perspectives during pandemics are limited.

This study aimed to examine the treatment demands of patients with psoriasis with varying disease severity and other clinical and personal characteristics in a real-world setting throughout the recurrent COVID-19 pandemic, hoping to provide references for personalized treatment strategies not only for patients with psoriasis during the COVID-19 pandemic but also for patients with all other chronic diseases in any future pandemic lockdowns.

MATERIALS AND METHODS

Study design, patients, and data collected

This was a cross-sectional, multicenter study based on a nationwide real-world big data collection platform established by the Psoriasis Standardized Diagnosis and Treatment Center (also named Psoriasis Center) and led by the National Clinical Research Center for Skin and Immune Disease.(33) This data platform is the first and currently the largest psoriasis registry in China, and as of September 2021, had included data of 32,014 patients with psoriasis from 228 hospitals across China. The registry collects data on demographics,

- medical history, clinical assessment, previous and current treatments for psoriasis, self-reported quality of life, and treatment demands at enrollment. All patients provided informed consent for publication before their details were entered into the registry. The establishment of this big data collection platform was approved by the Human Genetic Resources Management Office of the Ministry of Science and Technology of China (approval number: 2022-CJ0021) and the ethics committee of Peking University First Hospital (approval number: 2020-scientific research-255) for use in clinical studies. The data preprocessing standards for derived variables and variables with potentially mistaken values are listed in Table S1 (Supplemental Material).
- All patients aged ≥18 years enrolled between August 2020 to September 2021 with complete baseline data were included. The differences in baseline characteristics between patients with complete and incomplete data are shown in Table S2 (Supplemental Material).
- Patient and public involvement
- Patients were not involved in the design, conduct, reporting, or dissemination plans of our research.
- Study measures
- The study outcomes were patients' treatment demands, which were all collected through "yes-or-no" questions in a face-to-face interview. The two primary treatment demands contained healing skin lesions quickly and improving mental health. The questionnaire also asked about other demands, including reducing social discrimination, working and socializing normally, relieving itchy feelings, relieving painful or burning feelings, and reducing the side effects of treatment and disease relapses. All the aforementioned treatment demands were treated as binary variables. Quality of life was additionally assessed by the Dermatology Life Quality Index (DLQI).
- The main exposure was psoriasis severity, which was assessed by the Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA), and the 5-point Investigator's Global Assessment (IGA).(12,13) According to the guidelines for the diagnosis and treatment of psoriasis in China (2023),(34) PASI score was categorized as mild (<3), moderate (3 to <10) and severe (≥10), whereas BSA (%) was categorized as mild (<3%), moderate (3% to <10%), and severe (≥10%). The 5-point IGA categorized the severity level as clear/almost clear (0/1), mild (2), moderate (3), and severe (4). Provincial COVID-19 data was summarized from the official website of the National Health Commission of the People's Republic of China

(http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml). Considering the maintenance period of both epidemic control measures and public response to the pandemic, the 7 days following the last day in which a new case was recorded were further classified into the same pandemic period. The COVID-19 pandemic variable was treated as binary according to the geographical location and enrolled day of each patient.

12 133 Statistical analysis

13
 134 Descriptive statistics were performed for each variable stratified by each treatment demand
 135 using frequencies (percentages) for categorical variables and median (interquartile range
 136 [IQR]) for continuous variables. Categorical variables were compared using chi-squared
 137 tests, whereas continuous variables were compared using the Kruskal–Wallis H test.

Multivariable logistic regression models were used to investigate the impact of psoriasis severity, as measured by PASI, BSA, and IGA, separately, on each treatment demand stratified by whether the patient was enrolled during the COVID-19 pandemic. To reduce potential confounding factors, all models were adjusted for demographic characteristics (sex, age, body mass index [BMI], marriage status, education, employment, and smoking habits) and clinical characteristics (psoriasis duration, family history, disease phenotype, nail/scalp/genital/palmoplantar involvement, comorbidities, and previous treatment). PASI, BSA, and IGA values were separately modeled in relation to each treatment demand, and were treated as continuous and categorical variables separately. A Q-test attached to the fixed effect model was performed to detect the heterogeneity between the impact of psoriasis severity on treatment demands during the COVID-19 pandemic lockdowns and normal periods. Mediation analysis was employed to investigate the effect of PASI/BSA/IGA on treatment demands mediated by DLQI, adjusting for the same confounding set above and additionally for COVID-19 lockdowns. Other potential factors influencing the treatment demands were examined using the same multivariable logistic regression models investigating the impact of PASI on quick skin healing and mental health improvement demands while adding the COVID-19 pandemic as a covariate. All data analysis was conducted using STATA/SE (StataCorp LLC 2021, Stata Statistical Software: Release 17, College Station, TX), and a *P*-value <0.05 was considered statistically significant.

51 157 **RESULTS** 52

53
 54
 158 General characteristics

Among the 29,412 adult patients enrolled as of September 2021 (Table S2, see
 Supplemental Material), 22,425 with complete baseline information from 212 tertiary
 hospitals across China were enrolled in this study. Exactly 65.0% of patients were men

Page 9 of 48

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1 2		
3	162	(n=14,567). The median age was 40 (IQR, 31–54) years, and the percentages of different
4 5	163	age groups were as follows: 18-45 years, 60.3% (n = 13,515); 46-60 years, 26.9% (n =
6 7	164	6,033); ≥61 years, 12.8% (n = 2,877). The median PASI and DLQI scores were 7.2 and 8,
8	165	respectively. Exactly 12.1% of the patients (n = 2,706) were enrolled during a COVID-19
9 10	166	lockdown in their provinces. Moreover, 89.7% (n = 20,111) and 38.0% (n = 8,531) of the
11	167	patients demanded a speedy healing of the skin lesions and mental health improvement,
12 13	168	respectively (Table 1).
14 15	169	Patients demanding the rapid healing of skin lesions tended to be female, younger,
16	170	employed, unmarried, have a college degree, have current smoking habits, enrolled during a
17 18	171	normal period without the COVID-19 lockdown, have a shorter psoriasis duration, have a
19 20	172	positive family history, have pustular or guttate psoriasis, have nail or scalp involvement, and
21	173	have a severer psoriasis condition, as measured by PASI, BSA, and IGA, while not having
22 23	174	palmoplantar involvement, comorbidities, such as psoriatic arthritis (PsA), or a history of use
24	175	of biologics (all <i>P</i> <0.05). By comparison, patients demanding mental health improvement
25 26	176	tended to be unemployed, have a longer psoriasis duration, have plaque, erythrodermic, or
27 28	177	arthropathic psoriasis, have lesions on special areas including nails, scalps, hands/soles,
29	178	and genitals, have more severe psoriasis conditions, and have deteriorated quality of life,
30 31	179	while not having a college degree, smoking habits, pustular or guttate psoriasis, or
32	180	comorbidities (all <i>P</i> <0.05). Patients' characteristics stratified by other treatment demands
33 34	181	are shown in Table S3 (Supplemental Material).
35 36	182	Impact of psoriasis severity on treatment demands stratified by the COVID-19
37	183	pandemic
38 39	184	Both multivariable logistic regression and trend tests confirmed that the increasing psoriasis
40 41	184	severity, as measured by PASI, significantly stimulated patients' primary treatment demands
42	185	of healing skin lesions rapidly (odds ratio [OR], 1.45; 95% confidence interval (CI), 1.27–
43 44	180	1.65; $P < 0.001$ for severe PASI versus mild PASI; and OR, 1.02; 95% CI, 1.01–1.02; P
45	187	<0.001 in the trend test) and improving mental health (OR, 2.21; 95% CI, 2.03–2.40; P
46 47	189	<0.001 for severe PASI versus mild PASI; and OR, 1.03; 95% CI, 1.02–1.03; <i>P</i> <0.001 in the
48 49	190	trend test) during a normal period without COVID-19 lockdown (shown in Fig. 1a–b; and
50	190	Table S4 (Supplemental Material)). The disease severity-triggered primary treatment
51 52	192	demands further increased during the COVID-19 lockdowns, including healing skin lesions
53	192	rapidly (OR, 2.19; 95% CI, 1.57–3.05 for severe PASI versus mild PASI; <i>P</i> <0.001) and
54 55	194	improving mental health (OR, 2.82; 95% CI, 2.24–3.55 for severe PASI versus mild PASI, P
56 57	194	<0.001), despite the statistical insignificance (both P =0.064 in the heterogeneity Q-test).
58	195	Other treatment demands, including reducing social discrimination, working and socializing
59 60	10	8
		δ

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normally, relieving painful or burning feelings, relieving itchy feelings, and reducing the treatment side effects, were also significantly stimulated by deteriorated skin conditions measured by PASI (all P < 0.05); moreover, the degree of this stimulation further intensified during the COVID-19 lockdown (shown in Fig. 1c-g). The exception was the demand for reducing relapses, which significantly declined as PASI increased. Nevertheless, the magnitude of this decline decreased during the pandemic lockdown (OR, 0.61; 95% CI, 0.49–0.75. P < 0.001 for severe PASI versus mild PASI during a non-COVID-19 period; and OR, 0.81; 95% CI, 0.58–1.12; P=0.196 during a COVID-19 lockdown; heterogeneity Q-test, P=0.001; shown in Fig. 1h).

Impact of psoriasis severity by different instruments on treatment demands stratified by the COVID-19 pandemic

Similar patterns of change in each treatment demand were also found as BSA and IGA increased during the normal period. However, the two measures motivated the treatment demands slightly differently during the pandemic lockdowns. Specifically, the magnitude of increasing BSA-triggered demands of rapidly healing skin lesions hardly changed during the pandemic lockdowns (OR, 1.33; 95% CI, 1.17–1.50; P <0.001 for severe BSA versus mild BSA during a normal period; and OR, 1.38; 95% CI, 0.999–1.896; P=0.051 during the pandemic lockdown; heterogeneity Q-test, P=0.663), whereas that of IGA-triggered demands significantly increased (OR, 1.64; 95% CI, 1.35–1.99; P <0.001 for IGA=4 versus IGA=0/1 during the normal period; and OR, 2.70; 95% CI, 1.63–4.49; P < 0.001 during the pandemic lockdown; heterogeneity Q-test, P=0.005). In contrast, the magnitude of the increase in demands of improving mental health triggered by BSA significantly increased during the pandemic (OR, 2.01; 95% CI, 1.85-2.19; P < 0.001; and OR, 3.27; 95% CI, 2.57-4.15; P <0.001; heterogeneity Q-test, P <0.001), whereas that triggered by IGA hardly changed (OR, 2.21; 95% CI, 1.94–2.51; P <0.001; and OR, 1.91; 95% CI, 1.36–2.68; P <0.001; heterogeneity Q-test, P=0.971; shown in Fig. 1a-b and Table sS5 & S6 [Supplemental Material]).

⁴⁷₄₈ 224 Impact of psoriasis severity on treatment demands mediated by quality of life

Further mediation analysis showed that increasing PASI motivated patients' treatment demands mainly by deteriorating their quality of life, including improving mental health (47.1%), reducing social discrimination (mediated proportion, 49.0%), working and socializing normally (72.1%), relieving painful (40.8%) or itchy (73.2%) feelings, and reducing the treatment side effects (74.3%). However, the proportion of the DLQI-mediated effect was small in the total effect of PASI on the demands for reducing relapses (7.6%) and

Page 11 of 48

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quickly healing skin lesions (0.6%). The aforementioned results were replicated when disease severity was examined by BSA and IGA (Table 2). Potential factors influencing treatment demands Apart from disease severity, multivariable logistic regression analysis also identified female sex (OR, 1.23; 95% CI, 1.11–1.36; P < 0.001), smoking status (OR, 1.17; 95% CI, 1.04–1.30; P=0.005), pustular psoriasis (OR, 1.71; 95% CI, 1.26-2.32; P=0.001), and nail involvement (OR, 1.28; 95% CI, 1.14–1.44, P < 0.001) to be significantly correlated with a higher demand for quick skin lesion healing. However, older age (OR, 0.994; 95% CI, 0.991-0.998; P=0.004), married status (OR, 0.82; 95% CI, 0.72–0.94; P=0.003), unemployed status (OR, 0.82; 95% CI, 0.70–0.95; P=0.010), COVID-19 lockdown (OR, 0.87; 95% CI, 0.77–0.99; P=0.037), arthropathic psoriasis (OR, 0.55; 95% CI, 0.47–0.64; P <0.001), palmoplantar involvement (OR, 0.75; 95% Cl, 0.67–0.85; P < 0.001), and comorbidities (OR, 0.86; 95% Cl, 0.76–0.97; P=0.018) were found to be significantly correlated with lower demand (Table 3). Moreover, the demand for the improvement of mental health was significantly higher in patients with arthropathic psoriasis (OR, 1.22; 95% CI, 1.09–1.37; P=0.001) and palmoplantar involvement (OR, 1.09; 95% CI, 1.01–1.18, P=0.027). However, this was lower among patients with older age (OR, 0.993; 95% CI, 0.991-0.996, P < 0.001), higher BMI (OR, 0.9955; 95% CI, 0.9914-0.9996; P=0.030), a college education (OR, 0.90; 95% CI, 0.84–0.95; P=0.001), smoking status (OR, 0.81; 95% CI, 0.75–0.86; P <0.001), pustular psoriasis (OR, 0.77; 95% CI, 0.65–0.92; P=0.003), guttate psoriasis (OR, 0.78; 95% CI, 0.71–0.84; P < 0.001), and comorbidities (OR, 0.90; 95% CI, 0.83–0.97; P=0.012). DISCUSSION

In this cross-sectional study, it was observed that patient demands for healing skin lesions and improving mental health significantly increased as psoriasis worsened, especially during the COVID-19 pandemic. Different psoriasis severity measures have different emphases in reflecting patients' treatment demands, which were magnified during the pandemic. The impact of disease severity on most treatment demands was mediated by deteriorated quality of life, except for the demands of rapid skin healing and relapse reduction, and thus other factors that stratified major treatment demands were also examined.

Patient-centered intervention is crucial for the treatment of psoriasis due to the chronic and non-fatal characteristics of the condition, in addition to the considerable disparity in prices of various treatment choices, especially in recent years with recurrent pandemic lockdowns. During a normal period, all treatment demands, ranging from improving the appearance of skin lesions and relieving irritating symptoms to psychological and daily functional support,

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significantly increased as psoriasis deteriorated, suggesting the need for more intensive treatment and psychological counseling for patients. The only exception was the demand for reducing relapses, which was demanded in only 4.7% of patients and further decreased as disease severity increased, indicating that most Chinese patients have recognized the chronic nature of psoriasis and accepted the recurrent relapses and living with a small number of skin lesions, thereby suggesting that clinicians should be aware that patients may have poor compliance in their remission periods.

Compared to normal periods, all treatment demands, including those for rapidly healing skin lesions and improving mental health, were further triggered by disease severity during pandemic lockdowns (shown in Fig. 1). This differed from previous reports, which demonstrated that patients' quality of life, as measured by DLQI, was less influenced by psoriasis during pandemic lockdowns.(10,31) The reason for the difference in results is complex. On one hand, because social activities were restricted, patients worried less about skin lesion appearance when socializing and were more fearful about contracting infectious diseases rather than the non-fatal psoriasis. Thus, better quality of life, as indicated by DLQI, was observed.(10,31) Our multivariable logistic models also showed that the COVID-19 pandemic itself was a protective factor in reducing the demands of healing skin lesions (Table 3). On the other hand, the restrictions in traveling and difficulties in accessing medical resources may exacerbate psoriasis and enhance treatment demands. (22) Although the pandemic lockdowns reduced the impact of psoriasis on socializing, the pandemic and self-isolations themselves could exert psychological impact on patients with psoriasis, such as health anxiety and low mood, (10,21) creating a vicious circle of worsening mental health and deteriorated psoriasis. Taking all these factors together, the study showed enhanced treatment demands in patients with more severe psoriasis during the pandemic lockdowns, suggesting that patients' treatment demands were more influenced by psoriasis and stress conditions rather than the reduced need for socializing. These indicate for clinicians that a more intensive treatment strategy with lasting effects and enhanced mental support is needed during lockdown. In addition, increasing evidence in recent years has shown that immunosuppressive treatment for psoriasis, including biologics, does not increase the risk of COVID-19 infection or the related complications, reinforcing the necessity of more intensive therapy during the pandemic. (28, 35, 36) Besides, a more accessible pathway, such as telemedicine and online medicine service, should be promoted as an "add-on" for in-person clinics, (22,30) to facilitate access to healthcare during pandemic lockdowns. All these factors might be generalized and integrated into the management of other chronic non-fatal diseases, (21) such as atopic diseases, during future pandemics to meet patients' treatment needs.

Page 13 of 48

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To further help recognize patients' needs according to their clinical manifestations in daily clinics, this study compared the impact of disease severity by different measures on each treatment demand. PASI, BSA, and IGA are all instruments measuring psoriasis severity and were found to be significantly correlated with one another.(37) PASI takes both the area coverage and lesion appearance into account, yet it is time-consuming to calculate. In contrast, BSA and IGA are easier to understand, yet only represent the lesion coverage or lesion appearance. (12,13) In this study, an overall more irritating skin appearance presented by a higher IGA further stimulated the demands for the quick relief of skin lesions themselves during the pandemic lockdown, whereas the larger lesion coverage presented by higher BSA further motivated demands for psychological solutions, including improving mental health and reducing social discrimination. Since PASI is difficult to obtain, this study suggests that BSA should be used as a "first-line" surrogate to represent the enhanced psychological needs of patients, whereas IGA should be used to represent the increased need for more intensive therapy during pandemic lockdowns.

As most previous studies focused on the quality of life of patients with psoriasis, which revealed that worsened quality of life was associated with worsened psoriasis, (38, 39) this study further investigated the impact of psoriasis on treatment demands mediated by quality of life. In this study, quality of life was measured by DLQI, which reflected patients' lesion feelings, daily activities, leisure, work and study, personal relationships, and treatment burden. We confirmed that increasing disease severity deteriorated patients' quality of life based on the aforementioned aspects, which further motivated corresponding treatment demands. However, although prevalent in the psoriasis population, <2% of the demand for quick skin lesion healing was mediated by deteriorated quality of life, indicating the existence of other factors influencing treatment demands.

Thus, this study further examined other factors potentially stratifying treatment demands. Young and female patients were found to have worse quality of life in previous studies, (38,40,41) as well as higher treatment demands for rapid skin lesion healing in this study. Unmarried and employed patients without comorbidities were also found to have stronger demands for quick healing. These might be because female, young, unmarried, and employed patients have higher requirements for self-image, and patients without comorbidities have fewer concerns regarding polypharmacy and drug interactions due to underlying diseases. Additionally, the same demands for quick healing were higher in patients with pustular psoriasis, which presents with fever, painful skin, and frequent flare-ups,(42) and in patients with nail psoriasis, which undermines daily function.(43) Thus, a more intensive treatment strategy is needed for these patients. Additionally, more

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psychological care should be provided to younger patients without a college education, as they may lack a basic understanding of the disease and were found to have higher demands for mental support in this study. The same support was also needed in patients with arthropathic psoriasis and palmoplantar psoriasis, which were linked with internalized stigma and poorer quality of life.(44,45)

Although, to our knowledge, this study is the largest real-world study to date investigating the treatment demands of patients with psoriasis during the pandemic lockdowns, there were limitations. First, the Psoriasis Center program enrolled patients from specific dermatological clinics, and a certain proportion of patients declined the enrollment request. Thus, the study population may not represent the general psoriasis population. Second, the demand for improving mental health was collected as a binary variable, while the psychological or psychiatric condition was not systematically assessed using specialized scales, such as Generalized Anxiety Disorder-2, Patient Health Questionnaire-2 and Short Form-12 Health Survey.(11,22,46) Further studies are warranted to guantitatively investigate patients' mental health condition and the degree of each treatment demand using specialized scales. Third, there was an issue regarding the missing data for this data platform. However, as the missing rate was not high, and missing at random was considered (Table S2 [Supplemental Material), a complete case analysis was considered sufficient for handling missing data and, therefore, used. Fourth, since the information on residence place was not collected, the COVID-19 pandemic information was matched to each patient only at a province level, even though the pandemic was prevented with a precise approach in China.

CONCLUSION

An increase in psoriasis severity significantly stimulates patients' treatment demands from quickly healing skin lesions and improving mental health aspects, especially during the pandemic lockdowns, indicating the need for an accessible pathway for patients with psoriasis getting more intensive treatment and mental support during future pandemics. To better recognize and meet patients' treatment demands during the pandemic, we suggest that BSA is used to determine the psychological needs of patients, while IGA should be used to reflect the desire to quickly heal lesions. Other demographic and clinical characteristics of each patient should also be considered for a more personalized treatment strategy during future pandemics. Moreover, since the COVID-19 pandemic is nearing its end in many countries, the results of this study could provide hints for personalized treatment for patients with non-fatal chronic diseases in future pandemic lockdowns.

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54 55	397	This study was conducted using deidentified data from the real-world data collection platform
56	398	of the Psoriasis Standardized Diagnosis and Treatment Center (http://www.psocenter.cn/).
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59 60		14

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FIGURE LEGENDS

Fig. 1. Odds ratio for the association between each treatment demand and psoriasis severity by different measures (PASI/BSA/IGA) during COVID-19 lockdowns (red line) and non-lockdown periods (blue line).

- Fig. 1. a Treatment demand for healing skin lesions rapidly
- Fig. 1. b. Treatment demand for improving mental health
- Fig. 1. c. Treatment demand for reducing social discrimination
- Fig. 1. d. Treatment demand for working and socializing normally
- Fig. 1. e. Treatment demand for relieving painful or burning feelings
- Fig. 1. f. Treatment demand for relieving itchy feelings
- Fig. 1. g. Treatment demand for reducing the side effects of treatment
- Fig. 1. h. Treatment demand for reducing relapses

PASI: Psoriasis Area and Severity Index; BSA: Body Surface Area; IGA: Investigator's Global Assessment.

Tables

Table 1. Demographic and clinical characteristics stratified by primarytreatment demands

	Healing skin lesions rapidly				nental health		Total	
	Yes	No	Р	Yes	No	Р	[–] (n=22,425)	
	(n=20,111)	(n=2314)	value	(n=8531)	(n=13,894)	value		
Male, n (%)	13,005 (64.7)	1562 (67.5)	0.007	5491 (64.4)	9076 (65.3)	0.144	14,567 (65.0)	
Age, y, median (IQR)	40 (31–53)	42 (33–55)	<0.001	40 (31–53)	40 (31–54)	0.227	40 (31–54)	
BMI, kg/m², median (IQR)	24.0 (21.7– 26.7)	24.2 (21.9– 26.9)	0.099	24.0 (21.8– 26.7)	24.1 (21.7– 26.8)	0.405	24.0 (21.7- 26.7)	
Unemployment*, n (%)	1755 (11.2)	239 (13.3)	0.001	833 (12.3)	1161 (10.8)	0.003	1994 (11.4	
Married, n (%)	15,316 (76.2)	1888 (81.6)	<0.001	6544 (76.7)	10,660 (76.7)	0.979	17,204 (76.7)	
Bachelor's degree, n (%)	7064 (35.1)	764 (33.0)	0.044	2860 (33.5)	4968 (35.8)	0.001	7828 (34.9	
Current smoker, n (%)	5443 (27.1)	580 (25.1)	0.040	2119 (24.8)	3904 (28.1)	<0.001	6023 (26.9	
COVID-19 lockdown, n (%)	2394 (11.9)	312 (13.5)	0.027	1032 (12.1)	1674 (12.1)	0.913	2706 (12.1	
Psoriasis duration, y, median (IQR)	6 (2-14)	8 (2-15)	<0.001	8 (2-15)	6 (1–14)	<0.001	6 (2-14)	
Family history, n (%)	3459 (17.2)	357 (15.4)	0.032	1452 (17.0)	2364 (17.0)	0.991	3816 (17.0	
Psoriasis phenotype [†] , n	, ,						20.0 (11.0	
Plaque psoriasis	16,335 (81.2)	1896 (81.9)	0.406	7105 (83.3)	11,126 (80.1)	<0.001	18,231 (81.3)	
Erythrodermic psoriasis	219 (1.1)	23 (1.0)	0.675	121 (1.4)	121 (0.9)	<0.001	242 (1.1)	
Pustular psoriasis	609 (3.0)	49 (2.1)	0.014	216 (2.5)	442 (3.2)	0.005	658 (2.9)	
Guttate psoriasis	2739 (13.6)	277 (12.0)	0.028 🧹	978 (11.5)	2038 (14.7)	<0.001	3016 (13.4	
Arthropathic psoriasis	1293 (6.4)	297 (12.8)	<0.001	668 (7.8)	922 (6.6)	0.001	1590 (7.1)	
Lesions on special areas	s, n (%)							
Nail	4861 (24.2)	504 (21.8)	0.011	2130 (25.0)	3235 (23.3)	0.004	5365 (23.9	
Scalp	13,127 (65.3)	1451 (62.7)	0.014	5709 (66.9)	8869 (63.8)	<0.001	14,578 (65.0)	
Palmoplantar	3928 (19.5)	530 (22.9)	<0.001	1863 (21.8)	2595 (18.7)	<0.001	4458 (19.9	
Genital	2681 (13.3)	333 (14.4)	0.157	1281 (15.0)	1733 (12.5)	<0.001	3014 (13.4	
Disease severity, media	n (IQR)							
PASI	7.2 (3.0– 15.0)	5.9 (2.6– 12.0)	<0.001	9.1 (3.9– 17.4)	6.0 (2.7– 12.8)	<0.001	7.2 (3.0– 14.6)	
BSA, %	10.0 (3.0– 30.0)	9.2 (3.0– 22.4)	<0.001	14.0 (5.0– 30.0)	8.0 (3.0– 25.0)	<0.001	10.0 (3.0– 30.0)	
IGA	3 (2-3)	2 (2-3)	<0.001	3 (2–3)	3 (2-3)	<0.001	3 (2–3)	
DLQI, median (IQR)	8 (3-12)	8 (2-12)	0.072	10 (6–15)	6 (2-10)	<0.001	8 (3–12)	
Comorbidity [‡] , n (%)	2850 (14.2)	395 (17.1)	<0.001	1177 (13.8)	2068 (14.9)	0.010	3245 (14.5	
Previous use of biologics§	1726 (8.6)	256 (11.1)	<0.001	732 (8.6)	1250 (9.0)	0.286	1982 (8.8)	

1 2 3 4 5 6	BMI, bo Investig Index. *The un
7 8 9 10 11	patients [†] Pheno [‡] Comor respirat disease
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29 30 31 32 33 34	
35 36 37 38 39	
40 41 42 43 44 45	
46 47 48 49 50	
51 52 53 54 55 56	
57 58 59	

ody mass index; BSA, Body Surface Area; DLQI, Dermatology Life Quality Index; IGA, ator's Global Assessment; IQR, interquartile range; and PASI, Psoriasis Area and Severity

employment rate was calculated in the working-age population, which excluded retired and students.

types were not mutually exclusive, thus the total percentage was higher than 100%.

bidity presented the existence of any disease conditions, including cardiovascular diseases, ory diseases, kidney diseases, rheumatic diseases, digestive diseases, tumors, endocrine es, and so on.

ics included tumor necrosis factor- α inhibitors and interleukin inhibitors.

BMJ Open Table 2. Proportion of causal effect of disease severity on treatment demands, as mediated by quality of life

Treatment demands	PASI			BSA					
	Indirect effect*	Total effect [†]	Mediated proportion [‡]	Indirect effect [*]	Total effect [†]	Mediated of proportion	a andirect	Total effect [†]	Mediated proportion [‡]
Healing skin lesions rapidly	<0.001	0.001	0.6%	<0.001	0.001	1.4%	g g g<0.001	0.019	0.3%
Improving mental health	0.009	0.020	47.1%	0.004	0.007		<u>.</u>	0.186	52.6%
Reducing social discrimination	0.006	0.013	49.0%	0.003	0.005	53.5%	nem 20.064	0.118	54.3%
Working and socializing normally	0.025	0.035	72.1%	0.010	0.015		6 1 1 1 1 1 1 1 1 1 1	0.289	90.0%
Relieving painful or burning feelings	0.010	0.024	40.8%	0.004	0.009	45.5%	ຊັ ຼິຍຊິ 0.102	0.212	48.2%
Relieving itchy feelings	0.011	0.015	73.2%	0.004	0.003	139.4%		0.244	43.3%
Reducing the side effects of treatment	0.016	0.021	74.3%	0.006	0.007		1 1 1 1 1 1 1 1 1 1	0.145	111.9%
Reducing relapses	<0.001	0.003	7.6%	<0.001	0.001	5.9%		0.079	5.4%

BSA, Body Surface Area; IGA, Investigator's Global Assessment; and PASI, Psoriasis Area and Severity Index. *The indirect effect refers to the effect of PASI/BSA/IGA on each treatment demand mediated by quality of life. †The total effect refers to the sum of direct effects of PASI/BSA/IGA on each treatment demand and the indirect effects inediated by quality of life. training, and similar technologies mjopen.bmj.com/ on June 8, 2025 at Agence Bibliographique de l

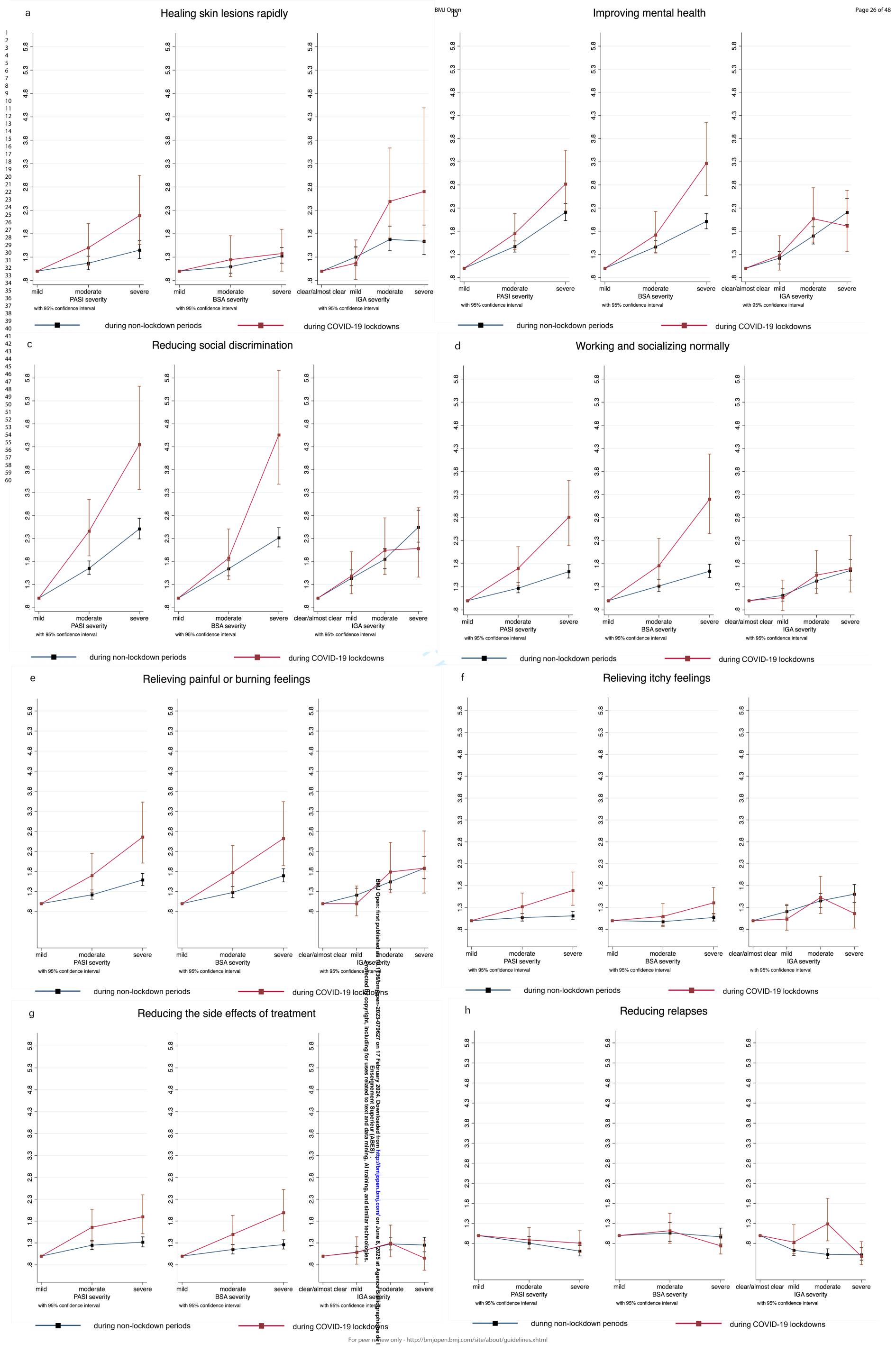
[‡]The mediated proportion equals to the indirect effect divided by the total effect.

Patient characteristics	Healing skin lesions rapi	dly	Improving mental health	
	OR (95% CI)	P value	OR (95% CI)	P value
Sex (reference: male)	1.23 (1.11–1.36)	<0.001	1.04 (0.98–1.11)	0.205
Age	0.994 (0.991–0.998)	0.004	0.993 (0.991–0.996)	<0.001
Body mass index	0.997 (0.990–1.003)	0.281	0.9955 (0.9914–0.9996)	0.030
Marriage (reference: unmarried)	0.82 (0.72–0.94)	0.003	1.06 (0.98–1.14)	0.166
Bachelor's degree	1.01 (0.92–1.12)	0.912	0.90 (0.84–0.95)	0.001
Unemployment	0.82 (0.70–0.95)	0.010	1.08 (0.98–1.20)	0.112
Current smoker	1.17 (1.04–1.30)	0.005	0.81 (0.75–0.86)	<0.001
COVID-19 lockdowns	0.87 (0.77–0.99)	0.037	1.02 (0.93–1.11)	0.726
Disease course	0.9996 (0.9989–1.0004)	0.319	0.9999 (0.9993–1.0005)	0.744
Family history	0.93 (0.82–1.05)	0.225	1.03 (0.95–1.11)	0.457
Psoriasis phenotype (refer	ence: plaque psoriasis)			
Erythrodermic psoriasis	1.19 (0.76–1.86)	0.435	1.09 (0.84–1.42)	0.503
Pustular psoriasis	1.71 (1.26–2.32)	0.001	0.77 (0.65–0.92)	0.003
Guttate psoriasis	1.14 (0.9995–1.31)	0.051	0.78 (0.71–0.84)	<0.001
Arthropathic psoriasis	0.55 (0.47–0.64)	<0.001	1.22 (1.09–1.37)	0.001
Lesions on specific areas				
Nail	1.28 (1.14–1.44)	<0.001	0.97 (0.90–1.04)	0.373
Scalp	1.07 (0.97–1.18)	0.158	1.0005 (0.94–1.06)	0.987
Palmoplantar	0.75 (0.67–0.85)	<0.001	1.09 (1.01–1.18)	0.027
Genital	0.93 (0.81–1.07)	0.323	1.08 (0.99–1.17)	0.087
Comorbidity	0.86 (0.76–0.97)	0.018	0.90 (0.83–0.97)	0.012
Previous use of biologics	0.87 (0.75–1.01)	0.077	1.02 (0.92–1.13)	0.682

Table 3. Relationship between other patient characteristics and primarytreatment demands

OR: odds ratio; and CI, confidence interval.

The relationship between other patient characteristics and primary treatment demands was identified by the same logistic regression models examining the impact of PASI on treatment demands.



Article type: Original Article

Title: Enhanced impact of psoriasis severity on treatment demands of patients during the COVID–19 pandemic: A cross–sectional study based on a national psoriasis registry in China

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Supplemental Material

potential mistaken values
population with complete data4
Table S3. Baseline characteristics stratified by treatment demands
Table S4. Mutlivariable logistic regression models examining the impact of PASI on
treatment demands stratified by COVID-19 lockdowns10
Table S5. Mutlivariable logistic regression models examining the impact of BSA on
treatment demands stratified by COVID-19 lockdowns11
Table S6. Mutlivariable logistic regression models examining the impact of IGA on
treatment demands stratified by COVID-19 lockdowns

Table S1. Data preprocessing standards for derived variables and variables with potential mistaken values

Patient characteristics	Data preprocessing standards
Height	Was treated as a missing value if height<80cm or >200cm
Weight	Was treated as a missing value if weight <25kg or >200kg
Psoriasis duration	The year of enrollment minus the year of diagnosis
Family history	Was treated as a missing value if the patient was unsure about the
	family history
Psoriatic arthritis	Was treated as "yes" if the patient was diagnosed with arthropathic
	psoriasis or psoriatic arthritis
Body Surface Area	Was treated as a missing value if BSA<75% for patients diagnosed with
	erythrodermic psoriasis
	erythrodermic psoriasis

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51 52 53 54 55 56	
57 58 59 60	

Table S2. Comparison of baseline characteristics between full population and study

 population with complete data

Patient characteristics	Full population (n=29 412)ª	Study population (n=22 425)	Missing number an proportion
Male, No. (%)	19 120 (65.1)	14 567 (65.0)	53 (0.2)
Age, median (IQR), y	41 (32–54)	40 (31–54)	241 (0.8)
BMI, median (IQR), kg/m ²	24.0 (21.6–26.6)	24.0 (21.7–26.7)	678 (2.3)
Unemployment ^b , No. (%)	2544 (11.5)	1994 (11.4)	1019 (3.5)
Married, No. (%)	22 004 (77.5)	17 204 (76.7)	1018 (3.5)
Bachelor's degree or higher, No. (%)	9277 (34.5)	7828 (34.9)	2487 (8.5)
Current smoker, No. (%)	7101 (25.0)	6023 (26.9)	1018 (3.5)
Enrolled during the COVID-19 lockdowns	4178 (14.3)	2706 (12.1)	159 (0.5)
Psoriasis duration, median (IQR), y	6 (2–14)	6 (2–14)	27 (0.1)
Family history, No. (%)	21 924 (16.5)	3816 (17.0)	3166 (10.8)
Psoriasis phenotype, No. (%)			
Plaque psoriasis	24 574 (83.6)	18 231 (81.3)	17 (0.1)
Erythrodermic psoriasis	376 (1.3)	242 (1.1)	
Pustular psoriasis	968 (3.3)	658 (2.9)	
Guttate psoriasis	3670 (12.5)	3016 (13.4)	
Psoriatic arthritis	2302 (7.8)	1590 (7.1)	
Lesions on special areas, No. (%)			
Nail involvement	6440 (23.1)	5365 (23.9)	1527 (5.2)
Scalp involvement	18 190 (64.0)	14 578 (65.0)	986 (3.4)
Palm or/and sole involvement	5705 (20.3)	4458 (19.9)	1288 (4.4)
Genital involvement	3702 (13.3)	3014 (13.4)	1544 (5.2)
Disease severity, median (IQR)			
PASI	7.2 (3.0–14.7)	7.2 (3.0–14.6)	507 (1.7)
BSA	10.0 (3.4–30.0)	10.0 (3.0–30.0)	494 (1.7)
IGA	3 (2–3)	3 (2–3)	500 (1.7)
DLQI	8 (3–13)	8 (3–12)	1 261 (4.3)
Comorbidities No. (%)	4101 (13.9)	3245 (14.5)	2630 (8.9)
Previous biological treatment ^c , No. (%)	2603 (8.9)	1982 (8.8)	23 (0.1)
Treatment demands			
Healing skin lesions rapidly	25 213 (88.8)	20 111 (89.7)	1021 (3.5)
Improving mental health	10 706 (37.7)	8531 (38.0)	
Reducing social discrimination	8854 (31.2)	7042 (31.4)	
Working and socializing normally	8120 (28.6)	6604 (29.4)	
Relieving painful/ burning feelings	6979 (24.6)	5476 (24.4)	
Relieving itchy feelings	10 668 (37.6)	8549 (38.1)	

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Reducing side effects of treatment	8708 (30.7)	7162 (31.9)
Reducing relapses	1651 (5.8)	1063 (4.7)
Abbreviations: BMI, body mass index; PASI, Psoriasis	Area and Severity Index; BS	A, Body Surface Area; IGA, Investigator's Glob
Assessment; DLQI, Dermatology Life Quality Index.		
^a Totally 29,412 adults were enrolled in the registry by S	September 2021.	
^b Unemployment rate was calculated in the working–ag	ge population, which excluded	d retired patients and students.
$^\circ\mbox{Biological treatment}$ included Tumor Necrosis Factor-	α Inhibitors and Interleukin Ir	hibitors.
	_	
	5	

	Reduci	ing socia	al	Workin	g and		Relievi	ng painf	ul or	Relievi	ng itchy		R ed u c	ing the s	ide	Reduci	ing relap	ses
	discrin	nination		socializ	zing nor	mally	burnin	g feeling	s	feeling	S		e ffect _s	of treat	nent			
	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	ebrua Bens usees	No	Ρ	Yes	No	Ρ
	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val	<u>ණිසී</u> ්දී	(n=15	val	(n=10	(n=21	va
	42)	383)	ue	04)	821)	ue	76)	949)	ue	49)	876)	ue		263)	ue	63)	362)	ue
Demographics													4 D					
Male, n (%)	4664	9903	0.0	4438	10129	<0.	3631	10936	0.0	5506	9061	0.1		10010	0.0	675	13892	0.3
	(66.2)	(64.4)	07	(67.2)	(64.0)	001	(66.3)	(64.5)	16	(64.4)	(65.3)	73		(65.6)	04	(63.5)	(65.0)	07
Age,y,median(I	40(31	40(31	0.1	38(30	41(31	<0.	43(32	39(31	<0.	41(32	39(31	<0.	₽ ₹3 2	40(31	0.9	39(30	40(31	0.
QR)	-53)	-54)	21	-51)	-54)	001	-56)	-53)	001	-55)	-52)	001	from (ABE ta mi	-54)	35	-53)	-54)	42
BMI,kg/m²,medi	24.1(24.0(0.6	24.2(24.0(<0.	24.1(24.0(0.1	24.2(24.0(0.0	2492 <mark>6</mark>	24.0(0.0	23.4(24.1(<0
an(IQR)	21.9–	21.6–	08	21.9–	21.7–	001	21.9–	21.7–	59	21.8–	21.7–	02	ttp://bmjoper 8.0.0 יוסארואנמוקנות 1.2.0	21.7–	02	21.3–	21.8–	00
	26.7)	26.8)		27.0)	26.7)		26.7)	26.7)		27.0)	26.6)		2∰7.0 <u>₩</u>	26.6)		26.0)	26.8)	
Unemployment ^a ,	658	1336	0.3	668	1326	0.0	575	1419	<0.	873	1121	<0.		1254	<0.	85	1909	0.0
n (%)	(11.7)	(11.2)	32	(12.4)	(11.0)	08	(13.8)	(10.7)	001	(13.4)	(10.2)	001	ີ 🖞 3.0	(10.6)	001	(10.4)	(11.5)	43
Married, n (%)	5486	11718	0.0	4915	12289	<0.	4419	12785	<0.	6666	10538	<0.	5 5605	11644	0.0	806	16398	0.
	(77.9)	(76.2)	04	(74.4)	(77.7)	001	(80.7)	(75.4)	001	(78.0)	(75.9)	001	8 7.6	(76.3)	27	(75.8)	(76.8)	79
Bachelor's	2246	5582	<0.	2460	5368	<0.	1546	6282	<0.	2794	5034	<0.		5371	0.1	380	7448	0.
degree, n (%)	(31.9)	(36.3)	001	(37.3)	(33.9)	001	(28.2)	(37.1)	001	(32.7)	(36.3)	001	Leggn	(35.2)	96	(35.8)	(34.9)	56
Current smoker,	1685	4338	<0.	1854	4169	0.0	1447	4576	0.4	2351	3672	0.0		4068	0.3	259	5764	0.
n (%)	(23.9)	(28.2)	001	(28.1)	(26.4)	80	(26.4)	(27.0)	05	(27.5)	(26.5)	89	۲.33 (Br	(26.7)	10	(24.4)	(27.0)	60
COVID-19	889	1817	0.0	799	1907	0.9	647	2059	0.5	1051	1655	0.4	938 a A	1768	0.0	344	2362	<(
ockdown, n (%)	(12.6)	(11.8)	83	(12.1)	(12.1)	25	(11.8)	(12.1)	11	(12.3)	(11.9)	13	(13. A	(11.6)	01	(32.4)	(11.1)	00
Duration,y,	8(2–	6(1–	<0.	8(2–	6(1–	<0.	7(2–	6(1–	<0.	6(2–	6(1–	0.9	7(2– 6	6(1–	<0.	6(2–	6(2–	0.
median(IQR)	15)	14)	001	15)	14)	001	15)	14)	001	14)	14)	83	15) 15) 15)	14)	001	14)	14)	73

		ing socia	al	Workin	-			ng painf			ng itchy		0	ing the s		Reduci	ing relap)S€
		nination			zing nor	-		g feeling		feeling				of treat				
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	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val	Ses Sel	(n=15	val	(n=10	(n=21	1
Family bistomy a	42)	383)	ue	04)	821)	ue	76)	949)	ue	49)	876)	ue	2012	263)	ue	63)	362)	
Family history, n	1100 (15.6)	2716	<0. 001	1201	2615 (16 5)	0.0	862	2954	0.0 04	1458	2358	0.9	2024,7 Inemedit affed to	2492	<0.	184	3632	9
(%) Decriscie phones	(15.6)	(17.7)	001	(18.2)	(16.5)	03	(15.7)	(17.4)	04	(17.1)	(17.0)	06	e e so te so	(16.3)	001	(17.3)	(17.0)	
Psoriasis phenor	5934	(%) 12297	<0.	5417	12814	0.0	4473	13758	0.3	7016	11215	0.0	bownloadd t Superijeu text alfid	12408	0.9	929	17302	
Plaque psoriasis	(84.3)	(79.9)	<0. 001	(82.0)	(81.0)	0.0 71	(81.7)	(81.2)	0.3 39	(82.1)	(80.8)	0.0 20	Had Sold	(81.3)	0.9 86	929 (87.4)	(81.0)	
Erythrodermic	(04.3) 93	(<i>1</i> 9.9) 149	0.0	(02.0) 120	(01.0)	<0.	116	126	<0.	(02.1) 124	(00.0) 118	20 <0.		129	<0.	(07.4) 13	(81.0) 229	
psoriasis	(1.32)	(0.97)	18	(1.8)	(0.77)	001	(2.1)	(0.7)	-0. 001	(1.5)	(0.9)	-0. 001	from <u>ht</u> (ABES) ta∓mittr	(0.8)	чо. 001	(1.2)	(1.1)	
Pustular	184	474	0.0	156	502	0.0	230	428	<0.	250	408	0.9		469	0.0	25	633	
psoriasis	(2.6)	(3.1)	54	(2.4)	(3.2)	01	(4.2)	(2.5)	001	(2.9)	(2.9)	45	1989 1989 1984 1983	(3.1)	73	(2.4)	(3.0)	
Guttate	735	2281	<0.	809	2207	0.0	533	2483	<0.	1063	1953	<0.		2082	0.2	88	2928	
psoriasis	(10.4)	(14.8)	001	(12.3)	(13.9)	01	(9.7)	(14.6)	001	(12.4)	(14.1)	001	ກ ິດ (ງິ 3.0	(13.6)	20	(8.3)	(13.7)	
Arthropathic	595	995	<0.	498	1092	0.0	606	984 [´]	<0.	631	959	0.1	mj.co anĝisi	1054	0.1	60 ⁽	1530	
psoriasis	(8.5)	(6.5)	001	(7.5)	(6.9)	89	(11.1)	(5.8)	001	(7.4)	(6.9)	83	sig .5)	(6.9)	16	(5.6)	(7.2)	
Lesions on spec	ial areas	s, n (%)											on					
Nail	1701	3664	0.5	1943	3422	<0.	1548	3817	<0.	2280	3085	<0.	Juge 199	3346	<0.	286	5079	
involvement	(24.2)	(23.8)	83	(29.4)	(21.6)	001	(28.3)	(22.5)	001	(26.7)	(22.2)	001	028.29	(21.9)	001	(26.9)	(23.8)	
Scalp	4538	10040	0.2	4662	9916	<0.	3693	10885	<0.	5937	8641	<0.		9567	<0.	694	13884	
involvement	(64.4)	(65.3)	29	(70.6)	(62.7)	001	(67.4)	(64.2)	001	(69.5)	(62.3)	001	(70. 04)	(62.7)	001	(65.3)	(65.0)	
Palmoplantar	1519	2939	<0.	1482	2976	<0.	1390	3068	<0.	1906	2552	<0.	159 6	2868	<0.	209	4249	
involvement	(21.6)	(19.1)	001	(22.4)	(18.8)	001	(25.4)	(18.1)	001	(22.3)	(18.4)	001	(22. ຊົງ ຫ	(18.8)	001	(19.7)	(19.9)	
Continued													Bibliographique					

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		nination			- zing nor	mally		g feeling		feeling				of treat			•	
	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	Yes	No	Ρ	Yes T	No	Ρ	Yes	No	ŀ
	(n=70	(n=15	val	(n=66	(n=15	val	(n=54	(n=16	val	(n=85	(n=13	val	(के ब्राग्वे	(n=15	val	(n=10	(n=21	١
	42)	383)	ue	04)	821)	ue	76)	949)	ue	49)	876)	ue	egruary Inseig u Se s Sel	263)	ue	63)	362)	I
Lesions on spe	cial areas	s, n (%)											/ 2024 D gnement lated to					
Genital	1020	1994	0.0	1088	1926	<0.	936	2078	<0.	1403	1611	<0.	ĨĨ	1828	<0.	164	2850	(
involvement	(14.5)	(13.0)	02	(16.5)	(12.2)	001	(17.1)	(12.3)	001	(16.4)	(11.6)	001	ଞ୍ଚିଛୁଞ୍ଚ	(12.0)	001	(15.4)	(13.3)	Ę
Disease severity	, median	ı (IQR))o्स्तnloaded t आperieut (text and क्षेत्र					
PASI	9.6	6.0	<0.	9.0	6.4	<0.	9.2	6.4	<0.	7.9	6.6	<0.		6.5	<0.	5.8	7.2	•
	(4.2–	(2.7–	001	(3.7–	(2.8–	001	(3.9–	(2.8–	001	(3.3–	(2.8–	001	from (ABE Ita()nii	(2.8–	001	(2.6–	(3.0–	(
	17.4)	13.2)		17.1)	13.5)		18.0)	13.6)		16.1)	13.8)			13.9)		12.0)	14.7)	
BSA, %	15.0	8.0	<0.	13.0	10.0	<0.	15.0	10.0	<0.	10.0	10.0	<0.		10.0	<0.	9.0	10.0	(
	(5.0–	(3.0–	001	(5.0–	(3.0–	001	(5.0–	(3.0–	001	(3.3–	(3.0–	001	Altaii	(3.0–	001	(3.0–	(3.0–	8
	31.0)	25.0)		34.0)	25.0)		35.0)	25.0)		30.0)	27.0)		.000 go.000	27.0)		30.0)	30.0)	
IGA	3 (2–	2 (2–	<0.	3 (2–	3 (2–	<0.	3 (2–	3 (2–	<0.	3 (2–	3 (2–	<0.	ଞ୍ଚି (2- <mark>କ</mark> ୍ର	3 (2–	<0.	3 (2–	3 (2–	
	3)	3)	001	3)	3)	001	3)	3)	001	3)	3)	001	oben.bmj.com/ c .024 iffing _{co} an@sibfili	3)	001	3)	3)	(
DLQI, median	10(6–	6(2–	<0.	10(6–	6(2–	<0.	10(6–	7(2–	<0.	9(4–	7(2–	<0.	9 (4– 2	7(2–	<0.	8(3–	8(3–	(
(IQR)	16)	10)	001	17)	11)	001	16)	11)	001	14)	12)	001	on Juge)) Ia⊉tettin	11)	001	12)	12)	ę
Comorbidity ^c , n	906	2339	<0.	990	2255	0.0	872	2373	<0.	1404	1841	<0.	Å 58	2087	<0.	152	3093	(
(%)	(12.9)	(15.2)	001	(15.0)	(14.3)	03	(15.9)	(14.0)	001	(16.4)	(13.3)	001	Q.6.29	(13.7)	001	(14.3)	(14.5)	ę
Previous use of	631	1351	0.6	608	1374	0.2	414	1568	<0.	557	1425	<0.	025 997 998	1385	0.0	114	1868	(
biologics ^d	(9.0)	(8.8)	63	(9.2)	(8.7)	09	(7.6)	(9.3)	001	(6.5)	(10.3)	001	(8.3) ²	(9.1)	69	(10.7)	(8.7)	2

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^c Comorbidity presented the existence of any disease conditions including cardiovaso diseases, etc.	cular diseases, respiratory diseases, kidney diseas	ight, inceatic ses, rheueding ft	stive diseases, tumors, endocrine
⁸ ¹ Comorbidity presented the existence of any disease conditions including cardiovase diseases, etc. ¹ Biologics included Tumor Necrosis Factor -α Inhibitors and Interleukin Inhibitors.		17 February 2024. Downloaded from http://bmjopen.bmj.com/ on June 8, 2025 at Agence Bibliographique Enseignement Superieur (ABES) . for uses related to text and data mining, Al training, and similar technologies.	
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 Table S4. Mutlivariable logistic regression models examining the impact of PASI on treatment of the impact of PASI on treatment of the impact of PASI on treatment of the impact of the

Odds ratios (95% Cl)	Without	COVID-	-19 lockd	lowns				With CO	Hetero test	geneity				
	Mild	Moder	ate	Seve	re	Trend	Test ^a	Mild	Modera	ate	or uses leggin s Sevengen Sevengen	Trend Test	Q	Р
	PASI<3	PASI 3 to <10		PASI	≥10			PASI<3	PASI 3	to <10	Severate PASI		(df)	value
Healing skin lesions	1.0	1.17	(1.03–	1.45	(1.27–	1.02	(1.01–	1.0	1.50	(1.12–	2.19 g 2.19	1.04 (1.02–	3.42	0.064
rapidly		1.32)*		1.65)	**	1.02)**	*		2.02)**		3.05)**ang	1.06)***	(1)	
mproving mental	1.0	1.47	(1.35–	2.21	(2.03–	1.03	(1.02–	1.0	1.75	(1.40–	2.82	1.04 (1.03–	3.44	0.064
nealth		1.59)***		2.40)	**	1.03)**	*		2.18)***		3.55)***** A fo	1.05)***	(1)	
Reducing social	1.0	1.65	(1.52–	2.51	(2.29–	1.03	(1.02–	1.0	2.46	(1.92–	4.35	1.05 (1.04–	12.82	<0.001
discrimination		1.81)***		2.74)	**	1.03)**	*		3.15)***		5.62)*	1.06)***	(1)	
Working and	1.0	1.27	(1.17–	1.63	(1.49–	1.02	(1.01–	1.0	1.70	(1.33–	2.81 42.	1.03 (1.02–	9.09	0.003
socializing normally		1.39)***		1.78)	**	1.02)**	*		2.17)***		3.60)* <mark>2</mark>	1.04)***	(1)	
Relieving painful or	1.0	1.22	(1.11–	1.59	(1.45–	1.02	(1.02–	1.0	1.70	(1.28–	2.66 🖣 2.00 –	1.04 (1.03–	9.74	0.002
ourning feelings		1.34)***		1.75)	**	1.02)**	*		2.25)***		3.53)** a	1.05)***	(1)	
Relieving itchy	1.0	1.07	(0.99–	1.11	(1.03–	1.01	(1.004–	1.0	1.32	(1.06–	1.69 ≦ 1.35–	1.02 (1.01–	8.27	0.004
eelings		1.16)		1.21)		1.01)**	*		1.63)*		2.11)** ਬ੍ਰੇ 9	1.03)***	(1)	
Reducing the side	1.0	1.25	(1.15–	1.32	(1.21–	1.01	(1.01–	1.0	1.66	(1.33–	1.90 ឆ្មិ៍1.ទ្ឋ័ា–	1.02 (1.01–	2.44	0.118
effects of treatment		1.36)***		1.44)	**	1.01)**	*		2.07)***		2.40)* ¹¹³ (8	1.03)***	(1)	
Reducing relapses	1.0	0.81	(0.67–	0.61	(0.49–	0.98	(0.98–	1.0	0.89	(0.66–	0.81 🕰 0.5	1.01 (0.997–	10.88	0.001
		0.97)*		0.75)	**	0.99)**	*		1.20)		1.12) <mark>ທີ່ ຫ</mark>	1.02)	(1)	

Page 37 1 2 3 4 5		lutlivariabl	e logistic regres	ssion models	BMJ Oper		3SA on treatm	s njopen-2023-0796#mands 1 by copyright, inctading netading	tratified by CO	VID–19	
-	Odds ratios (95% Cl)	Without C	OVID–19 lockdow	ns		With CO	With COVID-19 lockdowns Ebrua				
0 1	,	Mild BSA<3%	Moderate BSA 3 to <10%	Severe BSA≥10%	Trend Test ^a	Mild BSA<3%	Moderate BSA 3 to <10%		Trend Test	test Q (df)	Р value
5 4 -	Healing skin lesions rapidly	1.0	1.10 (0.96–1.26)	1.33 (1.17– 1.50)***	1.01 (1.01– 1.01)***	1.0	1.25 (0.88 1.76)	ont 500 (0.999– 3- text ann 500 (0.999– ann 500 (0.999– ann 500 (0.999–	1.01 (1.001– 1.01) [*]	0.19 (1)	0.663
6	Improving mental health	1.0	1.46 (1.33– 1.60)***	2.01 (1.85– 2.19)***	1.01 (1.01– 1.01)***	1.0	1.72 (1.33 2.23)***	arö. 1442€5)*** ⊐880	1.02 (1.01– 1.02)***	22.01 (1)	<0.001
0	Reducing social discrimination	1.0	1.64 (1.48– 1.81) ^{***}	2.32 (2.12– 2.54)***	1.01 (1.01– 1.01)***	1.0	1.87 (1.40 2.51)***	in (9, 5, 9, 7)***	1.02 (1.02– 1.03) ^{***}	37.08 (1)	<0.001
1 2	Working and socializing normally	1.0	1.32 (1.19– 1.45) ^{***}	1.64 (1.50– 1.79) ^{***}	1.01 (1.01– 1.01)***	1.0	1.76 (1.32 2.35)***		1.02 (1.01– 1.02) ^{***}	13.25 (1)	<0.001
4 5	Relieving painful or burning feelings	1.0	1.28 (1.15– 1.42)***	1.70 (1.54– 1.87) ^{***}	1.01 (1.01– 1.01) ^{***}	1.0	1.78 (1.29 2.45)***	a	1.01 (1.01– 1.02)***	3.84 (1)	0.050
7	Relieving itchy feelings	1.0	0.98 (0.89–1.07)	1.07 (0.99– 1.16)	1.001 (0.999– 1.002)	1.0	1.10 (0.86 1.39)	nilar 1.796)**	1.01 (1.004– 1.01) ^{***}	11.34 (1)	0.001
)	Reducing the side effects of treatment	1.0	1.15 (1.05– 1.26) ^{**}	1.26 (1.16– 1.37)***	1.003 (1.002– 1.005)***	1.0	1.93)**	6- te 1.5 μ (1.57- h 2.5 μ (1.57- h 2.5 μ (1.57-	1.01 (1.003– 1.01) ^{***}	3.66 (1)	0.056
<u>2</u> 3	Reducing relapses	1.0	1.06 (0.85–1.32)	0.97 (0.79– 1.18)	0.997 (0.99– 1.001)	1.0	1.12 (0.81 1.55)	1- <u><u><u></u><u></u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u></u>	0.996 (0.99– 1.003)	0.07 (1)	0.785
34 — 35 36 37 38 39 40 41 42 43 44 45 46	affected, comorbid ^a BSA was treated	lities, and previo as a continuous	bus treatment, stratified to variable in the trend test ant at <i>P</i> <0.010; ***Signifi	by whether was enro st. icant at <i>P</i> <.001.	e, BMI, marriage, educat Iled during the COVID par 1 - http://bmjopen.bmj	ndemic.		ence Bibliographique o	type, whether special a	areas were	

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 Table S6. Mutlivariable logistic regression models examining the impact of IGA on treatment of the model of the mod

⁄Odds ratios (95% ³ Cl)	5% Without COVID–19 lockdowns										With COVID-19 lockdowns							Heterogenei ty test		
9 ⁻⁷ 10	Almost	Mild		Mode	rate	Seve	re	Trend	Test ^a	Almost	Mild		Mode	a 59	Seve	re	Trend	Test	Q Q	P
11 12 13	clear IGA=0/1	IGA=2		IGA=:	3	IGA=4	4			clear IGA=0/1	IGA=	2	IGA Bant S	D	IGA=4	4			(df)	value
₁∌ ₁⊭lealing skin	1.0	1.30	(1.12–	1.68	(1.44–	1.64	(1.35–	1.21	(1.14–	1.0	1.17	(0.82–	2.49 j	8.71-	2.70	(1.63–	1.49	(1.30–	7.75	0.005
¹ fesions rapidly		1.52)**		1.96)*	**	1.99)*	**	1.27)*	**		1.67)		3.64 g	ade	4.49)*	**	1.71)**	*	(1)	
16 Improving mental	1.0	1.22	(1.09–	1.70	(1.52–	2.21	(1.94–	1.30	(1.26–	1.0	1.28	(0.96–	2.07	0 1.57–	1.91	(1.36–	1.30	(1.18–	<0.0	0.971
1 8 ealth		1.36)***		1.90)*	**	2.51)*	**	1.35)*	**		1.70)		2.74	m	2.68)*	**	1.43)**	*	1 (1)	
Reducing social	1.0	1.43	(1.27–	1.85	(1.64–	2.55	(2.22–	1.32	(1.28–	1.0	1.48	(1.10–	2.040 · (52–	2.08	(1.46–	1.29	(1.17–	0.21	0.646
20 pdiscrimination		1.61)***		2.08)*	**	2.92)*	**	1.37)*	*		2.01)	*	2.75 [*] **	://br	2.97)*	**	1.43)**	*	(1)	
202Vorking and	1.0	1.12	(0.99–	1.43	(1.27–	1.65	(1.45–	1.19	(1.14–	1.0	1.06	(0.78–	1.55	2 .16–	1.69	(1.19–	1.24	(1.12–	0.54	0.461
23 socializing normally		1.26)		1.60)*	**	1.89)*	**	1.23)*	*		1.44)		2.09	en.	2.41)*	*	1.37)**	*	(1)	
∠4 ₂Relieving painful or	1.0	1.21	(1.06–	1.54	(1.36–	1.88	(1.62–	1.23	(1.18–	1.0	1.00	(0.69–	1.79 (27–	1.88	(1.26–	1.32	(1.18–	1.29	0.256
2 6 urning feelings		1.38)**		1.76)*	**	2.18)*	**	1.28)*	**		1.44)		2.53 4 **	ŝ	2.81)*	*	1.48)**	*	(1)	
27 Relieving itchy 28	1.0	1.21	(1.08–	1.45	(1.30–	1.61	(1.41–	1.17	(1.13–	1.0	1.04	(0.78–	1.53 <u>5</u> (₫ .16—	1.16	(0.83–	1.13	(1.03–	0.38	0.539
28 2fçeelings		1.35)**		1.62)*	**	1.83)*	**	1.21)*	*		1.37)		2.01	חך נ	1.63)		1.24)*		(1)	
³ Reducing the side	1.0	1.09	(0.97–	1.28	(1.14–	1.25	(1.10–	1.09	(1.05–	1.0	1.08	(0.82–		7 7 9 8 9 8	0.96	(0.69–	1.02	(0.93–	1.37	0.241
³¹ effects of treatment		1.22)		1.43)*	**	1.43)*	*	1.13)*	*		1.44)		÷ ·	, 202	1.35)		1.13)		(1)	
38 Reducing relapses	1.0	0.63	(0.50–	0.53	(0.42-	0.52	(0.39–	0.79	(0.73–	1.0	0.83	(0.55–		N.87-	0.48	(0.27–	0.98	(0.85–	5.86	0.016
34		0.79)***		0.67)*	**	0.70)*	**	0.87)*	*		1.27)		1.92)	≓ A	0.85)*		1.13)		(1)	
35 36 Abbrevi	ations: IGA, In	vestigator's	Global A	Assessme	ent. All the	models a	adjusted for	r sex, age	e, BMI, ma	rriage, educat	ion, smo	ke, disease	e course, fa	n Enily his	tory, dise	ase phenot	ype, whe	ther speci	al	
30	areas were affected, comorbidities, and previous treatment, stratified by whether was enrolled during the COVID pandemic.																			
38 ^a IGA wa	^a IGA was treated as a continuous variable in the trend test.																			
39	ant at <i>P</i> <0.050					at <i>P</i> <.00 ⁻	1						c	ogra						
40 eiginne 41		.,		,	- 3		-						-	aphique						
42									1				-	gue						

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STROBE Statement—checklist of items that should be included in report	ts of observational studies
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of 48				BMJ Open be included in reports of observational studies
STROBE St	tateme	nt—checklist of items that s	hould	be included in reports of observational studies
	Item No.	Recommendation	Page No.	Relevant text from manusgript
Title and abstract	1	(<i>a</i>) Indicate the study's design with a commonly used term in the title or the abstract	1	Enhanced impact of psoriasis severity on treatment demands of patients during the COVID-19 pandemic: A cross- sectional study based on a national psoriasis registry in China
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3	Objectives: The personalized treatment demands of patients with and a pandemic lockdown. This study aimed to investigate the treatment demands of patients with psoriasis with different severities, stratified by COVID-19 pandemic conditions.
				Design: Cross-sectional study design.
				Setting: Multicenter study based on a national psoriasis registry in E
				Participants: A total of 22,425 adult patients with psoriasis were and between August 2020 and September 202
				Primary and Secondary Outcome Measures: The primary outcome vere patient demands for quick healing of sl lesions and improving mental health, which were collected by que to examine the impact of disease severity, as measured by Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA), and Investigator's Global Assessment (IGA), on treatment demands, as stratified by COVID-19 pande conditions (lockdown vs. non-lockdown).
				Results: Increasing PASI score significantly increased patient demand for rapid healing of skin lesions and improvemental health during non-lockdown periods. The magnitude of both associations further increased during the COVI 19 lockdown from an odds ratio (OR) of 1.45 (95% confidence interval (CI) 1.27–1.65) to 2.19 (95% CI 1.57–3.05) and 2.11 (95% CI 2.03–2.40) to 2.82 (95% CI 2.24–3.55), respectively The skin lesion healing demand was more triggered by the overall irritation level (measured by IGA, OR=1.62, 95% CI 1.35–1.99 during non-lockdown period versus OR=2.70, 95% CI 1.63–4.49 during lockdowns); while the therefore the above triggered by lesion coverage (measured by BSA, OR=2.01, 95% CI 1.85–2.19 versus OR=3.27, 95% CI 2.57–4.15)
				Conclusions : Psoriasis aggravation significantly increased patients treatment demands, especially during lockdowns. The used psoriasis severity measures highlighted patients is the attended differently. This suggests more accessible and personalized healthcare for patients with psore sis should be available during future pandemics.
Introduction				<u>к</u> . а
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5	Psoriasis is a chronic, non-fatal disease primarily affecting the skin. The prevalence of psoriasis varies geographical with 0.14% and 1.99% of the population in East Asia and Australasia being affected, respectively. ¹ In China, the prevalence was 0.12% in 1987 and 0.47% in 2012. ² Apart from skin lessons, psoriasis is also now recognized as a systemic inflammatory disorder that relates to various comorbidities, such as metabolic syndrome, arthritis, malignancy, and so on. ³ Poor appearances, together with comorbidities significantly impair patients' daily function and cause significant psychological distress, ⁴ which can result in depression, suicidal ideation, and substance abuse, causing high social burdens. especially during the recurrent coronavirue disease 2019 (COVID-19) pandemics. ⁹⁻¹¹
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			Current clinical diagnosis and treatment for psoriasis must follow appropriate guidelines and consensus. Therefore, the choice of treatment for psoriasis primarily depends on the objective assessment of lesion severity of the disease, yet the demands of the patient are often neglected. ^{12 13} However, due to the chronic, non-fatal characteristics of psoriasis, individual perceptions of the disease can determine the impact of provide should be driven by the real needs and expectations of each individual
			Furthermore, since healthcare access (e.g. emerged telemedicine), well as the clinicians' treatment considerations to control psoriasis, have all changed during the rearread COVID-19 pandemics, ²⁰ patients' mental health condition, their perception of psoriasis and further treatment treatment accordingly. ²¹⁻²³ From the treatment-decision aspect, the initiation of biologics for psoriasis defined sharply during the COVID-19 pandemic, possibly due to the poor access to healthcare for patients and the labor evidence on the relationship between COVID-19 infection and biological therapies for psoriasis at the beinging of the pandemic. ^{24 25} From a healthcare-seeking behavior perspective, patients with psoriasis tended to can be defer their appointments, lose adherence to treatment, and require prolonged prescription or treatment-change and the COVID-19 pandemic. ^{9 26-28} All the above changes may be associated with deterioration of psoriasis and further from a quality of life perspective, the social-activity aspect assessed in a quality of life questionnaire became in the COVID-19 lockdown, which led to paradoxically improved quality of life among patients with psorias for partice about skin lesion appearances due to restricted social activities, and are more fearful of COVID-19 where receiving immunosuppressive treatment for psoriasis. ³² As a result, how patients' treatment demands to improve personalized treatment during the pandemic. However, studies on changes in treatment demands from patients' perspectives during pandemics are limited.
			This study aimed to examine the treatment demands of patients with pseriasis with varying disease severity and other clinical and personal characteristics in a real-world setting throughout the recurrent COVID-19 pandemic, hoping to provide references for personalized treatment strategies not only for patients with psoriasis during the COVID-19 pandemic but also for patients with all other chronic diseases in an future pandemic lockdowns.
Objectives	3	State specific objectives,5including any prespecifiedhypotheses	This study aimed to examine the treatment demands of patients with pseriasis with varying disease severity and other clinical and personal characteristics in a real-world setting throughout the recurrent COVID-19 pandemic, hoping to provide references for personalized treatment strategies not only for patients with psoriasis during the COVID-19 pandemic but also for patients with all other chronic diseases in an fuger pandemic lockdowns.
Methods			о Х , а
Study design	4	Present key elements of study 5 design early in the paper	Study design, patients, and data collected Image: Collection of the study based on a nationwide ready world big data collection platform established by the Psoriasis Standardized Diagnosis and Treatment Center (also national Bed Psoriasis Center) and led by the National Clinical Research Center for Skin and Immune Disease.
Setting	5	Describe the setting, locations, 5-6 and relevant dates, including periods of recruitment,	Study design, patients, and data collected This was a cross-sectional, multicenter study based on a nationwide read-world big data collection platform establishe by the Psoriasis Standardized Diagnosis and Treatment Center (also national provided and provided by the National

exposure, follow-up, and data collection	Clinical Research Center for Skin and Immune Disease. ³³ This data platform is the first and currently the largest psoriasis registry in China, and as of September 2021, had included data of 32,014 patients with psoriasis from 228 hospitals across China. The registry collects data on demographics medical history, clinical assessment, previous and current treatments for psoriasis, self-reported quality of life, and treatment demands at enrollment. All patients
	provided informed consent for publication before their details wergented into the registry. The establishment of thi big data collection platform was approved by the Human Genetic Resources Management Office of the Ministry of Science and Technology of China (approval number: 2022-CJ002 First the ethics committee of Peking University First Hospital (approval number: 2020-scientific research-255) for the ethics are listed in Table S1 (Supplemental Material).
 6 (a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls Cross-sectional study—Give the eligibility criteria and the 	 (a) All patients aged ≥18 years enrolled between August 2020 to September 2021 with complete baseline data were included. The differences in baseline characteristics between patients and incomplete data are shown i Table S2 (Supplemental Material). (b) All training, and similar to the difference of the diffe
sources and methods of selection of participants (b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed Case-control study—For matched studies, give matching criteria and the	m/ on June 8, 2025 at Agen imilar technologies.
number of controls per case 7 Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if	6-7 Study measures The study outcomes were patients' treatment demands, which were all bollected through "yes-or-no" questions in a face-to-face interview. The two primary treatment demands contained the aling skin lesions quickly and improving mental health. The questionnaire also asked about other demands, including reducing social discrimination, working
-	eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow- upCase-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controlsCross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed Case-control study—For matched studies, give matching criteria and the number of controls per case7Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give

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		applicable		and socializing normally, relieving itchy feelings, relieving painful or borning feelings, and reducing the side effects treatment and disease relapses. All the aforementioned treatment demands were treated as binary variables. Quality life was additionally assessed by the Dermatology Life Quality Index (DLQI).
				The main exposure was psoriasis severity, which was assessed by the Psoriasis Area and Severity Index (PASI), Bo Surface Area (BSA), and the 5-point Investigator's Global Assessment TGA). ^{12 13} According to the guidelines for the diagnosis and treatment of psoriasis in China (2023), ³⁴ PASI score grass ategorized as mild (<3), moderate (3 to <10 and severe (≥ 10), whereas BSA (%) was categorized as mild (<3%), moderate (3% to <10%), and severe ($\geq 10\%$). T 5-point IGA categorized the severity level as clear/almost clear (0/z), and severe (3), and severe (4).
				Provincial COVID-19 data was summarized from the official web did the National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/yqtb/list did thtml). Considering the maintenance period both epidemic control measures and public response to the pandemic did thtml. Considering the last day in which a ne case was recorded were further classified into the same pandemic did the COVID-19 pandemic variable was treated as binary according to the geographical location and enroll did the of each patient.
Data	8*	For each variable of interest,	6-7	Study measures
sources/ measuremen t		give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	sis	The study outcomes were patients' treatment demands, which were bollected through "yes-or-no" questions in a face-to-face interview. The two primary treatment demands contained aling skin lesions quickly and improving mental health. The questionnaire also asked about other demands, bollected through social discrimination, working and socializing normally, relieving itchy feelings, relieving painfue or terming feelings, and reducing the side effects treatment and disease relapses. All the aforementioned treatment demands were treated as binary variables. Quality life was additionally assessed by the Dermatology Life Quality Index (DLQI).
				The main exposure was psoriasis severity, which was assessed by the Psoriasis Area and Severity Index (PASI), Bo Surface Area (BSA), and the 5-point Investigator's Global Assessment IGA). ^{12 13} According to the guidelines for the diagnosis and treatment of psoriasis in China (2023), ³⁴ PASI score grass ategorized as mild (<3), moderate (3 to <10 and severe (\geq 10), whereas BSA (%) was categorized as mild (<3%), moderate (3% to <10%), and severe (\geq 10%). T 5-point IGA categorized the severity level as clear/almost clear (0/ \pm), mild (2), moderate (3), and severe (4).
				Provincial COVID-19 data was summarized from the official website of the National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/yqtb/list_gcbdchtml). Considering the maintenance period both epidemic control measures and public response to the pandengc, the 7 days following the last day in which a no case was recorded were further classified into the same pandemic period. The COVID-19 pandemic variable was treated as binary according to the geographical location and enrolligit day of each patient.
Bias	9	Describe any efforts to address potential sources of bias	7	Multivariable logistic regression models were used to investigate the inpact of psoriasis severity, as measured by PASI, BSA, and IGA, separately, on each treatment demand stratified by whether the patient was enrolled during the COVID-19 pandemic. To reduce potential confounding factors, all models were adjusted for demographic characteristics (sex, age, body mass index [BMI], marriage status, education, employment, and smoking habits) and clinical characteristics (psoriasis duration, family history, disease phenotype, nail/scalp/genital/palmoplantar involvement, comorbidities, and previous treatment).
				Mediation analysis was employed to investigate the effect of PASI/BS FIGA on treatment demands mediated by DLQI, adjusting for the same confounding set above and additionally for COVID-19 lockdowns.
	10	Explain how the study size	5-6	This data platform is the first and currently the largest psoriasis registry in China, and as of September 2021, had

of 48		BMJ Open BMJ Open
	was arrived at	included data of 32,014 patients with psoriasis from 228 hospitals fr
Quantitative 11 variables	Explain how quantitative 6- variables were handled in the analyses. If applicable, describe which groupings were chosen and why	 According to the guidelines for the diagnosis and treatment of psoffasis in China (2023),³⁴ PASI score was categoriz as mild (<3), moderate (3 to <10) and severe (≥10), whereas BSA (%) was categorized as mild (<3%), moderate (3%) to <10%), and severe (≥10%). The 5-point IGA categorized the severite level as clear/almost clear (0/1), mild (2), moderate (3), and severe (4). Provincial COVID-19 data was summarized from the official web to the National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/yqtb/list for the National Health Commission of the People's Republic of China (http://www.nhc.gov.cn/xcs/yqtb/list for the National Health Commission of the pademic control measures and public response to the pandemic period. The COVID-19 pandemic variable was treated as binary according to the geographical location and enroll the part of each patient. PASI, BSA, and IGA values were separately modeled in relation to period. The COVID-19 pandemic variables separately.
Statistical 12 methods	 (a) Describe all statistical 7 methods, including those used to control for confounding 	Descriptive statistics were performed for each variable stratified by treatment demand using frequencies (percentages) for categorical variables and median (interquartile rate QR]) for continuous variables. Categorical variables were compared using chi-squared tests, whereas continues ariables were compared using the Kruskal-Wallis H test. Multivariable logistic regression models were used to investigate the impact of psoriasis severity, as measured by PASI, BSA, and IGA, separately, on each treatment demand stratified by whether the patient was enrolled during th COVID-19 pandemic. To reduce potential confounding factors, all models were adjusted for demographic characteristics (sex, age, body mass index [BMI], marriage status, ducation, employment, and smoking habits) and clinical characteristics (psoriasis duration, family history, disease menagype, nail/scalp/genital/palmoplantar involvement, comorbidities, and previous treatment). PASI, BSA, and GA values were separately modeled in relatit to each treatment demand, and were treated as continuous and categorical variables separately. A Q-test attached to fixed effect model was performed to detect the heterogeneity between the impact of psoriasis severity on treatment demands during the COVID-19 pandemic lockdowns and normal periods. Mediation analysis was employed to investigate the effect of PASI/BSA/IGA on treatment demands megiater by DLQI, adjusting for the same confound set above and additionally for COVID-19 lockdowns. Other potenal factors influencing the treatment demands were examined using the same multivariable logistic regression models are graving the impact of PASI on quick skin healing and mental health improvement demands while adding the COVID-19 pandemic as a covariate. All data analysis was conducted using STATA/SE (StataCorp LLC 2021, Stata fatistical Software: Release 17, College Station, TX), and a <i>P</i> -value <0.05 was considered statistically significare.
	(<i>b</i>) Describe any methods 7 used to examine subgroups and interactions	A Q-test attached to the fixed effect model was performed to detect the neterogeneity between the impact of psorias severity on treatment demands during the COVID-19 pandemic lockdowns and normal periods.
	(c) Explain how missing data 6 were addressed	All patients aged ≥ 18 years enrolled between August 2020 to September 2021 with complete baseline data were included. The differences in baseline characteristics between patients with complete and incomplete data are shown Table S2 (Supplemental Material).

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		(<i>d</i>) Cohort study—If applicable, explain how loss to follow-up was addressed	N/A	N/A		2023-079627 o
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed			ng for uses	n 17 Februa
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy			related to to	TV 2024 Do
		(<u>e</u>) Describe any sensitivity analyses	N/A	N/A	Superi	
Results					d da	a. Po
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7	All patients aged ≥18 years enrolled between August 2020 to Sep included. The differences in baseline characteristics between paties Table S2 (Supplemental Material). Among the 29,412 adult patients enrolled as of September 2021 (complete baseline information from 212 tertiary hospitals across of	ning Table	\$2, see Supplemental Material), 22,425 with
		(b) Give reasons for non- participation at each stage	N/A	N/A	and si	3.
		(c) Consider use of a flow diagram	N/A	N/A	milar t	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8	Exactly 65.0% of patients were men (n=14,567). The median age different age groups were as follows: 18-45 years, 60.3% (n = 13, 12.8% (n = 2,877). The median PASI and DLQI scores were 7.2 a 2,706) were enrolled during a COVID-19 lockdown in their provi	53(5);	2 6-60 years, 26.9% (n = 6,033); \geq 61 years, sepectively. Exactly 12.1% of the patients (n =
		(b) Indicate number of participants with missing data for each variable of interest	6	The differences in baseline characteristics between patients with (Supplemental Material).	compl	te and incomplete data are shown in Table S2
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	N/A	N/A		B
Outcome	15*	Cohort study—Report			t	
		Fc	or peer r	eview only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	nl c	

46

BMJ Open

je 45 of 48		BMJ Open	mjopen-2023-0 4 by copyright
data	numbers of outcome events or summary measures over timeCase-control study—Report numbers in each exposure category, or summary 	Moreover, 89.7% (n = 20,111) and 38.0% (n = 8,531) of the pa and mental health improvement, respectively (Table 1).	patientseigne patientseigne patientseigne patientseigne patientseigne patientseigne patientseigne patientseigne
Main results 16	(<i>a</i>) Give unadjusted estimates 7-10 and, if applicable, confounder- adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	To reduce potential confounding factors, all models were adjust mass index [BMI], marriage status, education, employment, ar duration, family history, disease phenotype, nail/scalp/genital/ treatment). Mediation analysis was employed to investigate the effect of I DLQI, adjusting for the same confounding set above and addit factors influencing the treatment demands were examined usin investigating the impact of PASI on quick skin healing and me COVID-19 pandemic as a covariate. Impact of psoriasis severity on treatment demands stratifie Both multivariable logistic regression and trend tests confirme PASI, significantly stimulated patients' primary treatment dem 1.45; 95% confidence interval (CI), 1.27–1.65; <i>P</i> <0.001 for set 1.01–1.02; <i>P</i> <0.001 in the trend test) and improving mental he PASI versus mild PASI; and OR, 1.03; 95% CI, 1.02–1.03; <i>P</i> < COVID-19 lockdown (shown in Fig. 1a–b; and Table S4 (Supp primary treatment demands further increased during the COVI (OR, 2.19; 95% CI, 1.57–3.05 for severe PASI versus mild PA 95% CI, 2.24–3.55 for severe PASI versus mild PASI, <i>P</i> <0.00 the heterogeneity Q-test). Other treatment demands, including normally, relieving painful or burning feelings, relieving itchy also significantly stimulated by deteriorated skin conditions me this stimulation further intensified during the COVID-19 lockd demand for reducing relapses, which significantly declined as decline decreased during the pandemic lockdown (OR, 0.61; 9 PASI during a non-COVID-19 period; and OR, 0.81; 95% CI, heterogeneity Q-test, <i>P</i> =0.001; shown in Fig. 1h). Impact of psoriasis severity by different instruments on tre pandemic Similar patterns of change in each treatment demand were also	and spotling habits) and clinical characteristics (psoriasi l/palma a tar involvement, comorbidities, and previous PAS (ISA/IGA on treatment demands mediated by itional C COVID-19 lockdowns. Other potential ing the multivariable logistic regression models nental the improvement demands while adding the ied by the COVID-19 pandemic ed that the increasing psoriasis severity, as measured by mands of healing skin lesions rapidly (odds ratio [OR], sever PASI versus mild PASI; and OR, 1.02; 95% CI, health (OR, 2.21; 95% CI, 2.03–2.40; $P < 0.001$ for sever P < 0.001 in the trend test) during a normal period withou pplene intal Material)). The disease severity-triggered (ID-15 loc downs, including healing skin lesions rapidly ASI; $e < 0.001$) and improving mental health (OR, 2.82; 001), despise the statistical insignificance (both $P=0.064$ g reducing social discrimination, working and socializin y feelings and reducing the treatment side effects, were neasured by PASI (all $P < 0.05$); moreover, the degree of cdown (shawn in Fig. 1c–g). The exception was the s PASI increased. Nevertheless, the magnitude of this 95% CI, 049–0.75, $P < 0.001$ for severe PASI versus mit 0.58-1.16; $P=0.196$ during a COVID-19 lockdown; reatment gemands stratified by the COVID-19
1	For peer re	pandemic	so found as BSA

 BMJ Open period. However, the two measures motivated the treatment demarks she but y differently during the pandemic lockdowns. Specifically, the magnitude of increasing BSA-triggered demands of rapidly healing skin lesions hardly changed during the pandemic lockdowns (OR, 1.33; 95% CI, 1.17 $\frac{1}{2}$.50 $\frac{1}{2}$ P <0.001 for severe BSA versus mild BSA during a normal period; and OR, 1.38; 95% CI, 0.999–1.896; P=0, =51 auring the pandemic lockdown; heterogeneity Q-test, P=0.663), whereas that of IGA-triggered demands significantly increased (OR, 1.64; 95% CI, 1.35–1.99; P <0.001 for IGA=4 versus IGA=0/1 during the normal period; and $\overline{Q}R$, $\overline{a}70$; 95% CI, 1.63–4.49; P < 0.001 during the pandemic lockdown; heterogeneity Q-test, P=0.005). In contrast, the physical proving mental health triggered by BSA significantly increased and the pandemic (OR, 2.01; 95% CI, 1.85–2.19; P < 0.001; and OR, 3.27; 95% CI, 2.57–4.15; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; and OR, 3.27; 95% CI, 2.57–4.15; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.36–2.68; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.36–2.68; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK, 2.01, 95% CI, 1.85–2.19; P < 0.001; heterogenear Cost statistics of the pandelline (OK Q-test, P=0.971; shown in Fig. 1a-b and Table sS5 & S6 [Supplen # Atterial]). Impact of psoriasis severity on treatment demands mediated by mainty of life

Further mediation analysis showed that increasing PASI motivated and the streatment demands mainly by deteriorating their quality of life, including improving mental heal **a b** (1%), reducing social discrimination (mediated proportion, 49.0%), working and socializing normally (72.1%), rel and painful (40.8%) or itchy (73.2%) feelings, and reducing the treatment side effects (74.3%). However, the property of the DLQI-mediated effect was small in the total effect of PASI on the demands for reducing relapses (7.6%) and the lesions (0.6%). The aforementioned results were replicated when disease severity was stand here by BSA and IGA (Table 2).

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Potential factors influencing treatment demands

		Totential factors influencing incatinent demands
		Apart from disease severity, multivariable logistic regression analysis also identified female sex (OR, 1.23; 95% CI, 1.11–1.36; $P < 0.001$), smoking status (OR, 1.17; 95% CI, 1.04–1.39; $P = 0.005$), pustular psoriasis (OR, 1.71; 95% CI, 1.26–2.32; $P=0.001$), and nail involvement (OR, 1.28; 95% CI, 1.27–1.34, $P < 0.001$) to be significantly correlated with a higher demand for quick skin lesion healing. However, older age (OR, 0.994; 95% CI, 0.991–0.998; $P=0.004$), married status (OR, 0.82; 95% CI, 0.72–0.94; $P=0.003$), unemployed status (OR, 0.82; 95% CI, 0.70–0.95; $P=0.010$), COVID-19 lockdown (OR, 0.87; 95% CI, 0.77–0.99; $P=0.037$), arthropathic psoriasis (OR, 0.55; 95% CI, 0.47–0.64; $P < 0.001$), palmoplantar involvement (OR, 0.75; 95% CI, 0.67–0.35; $P < 0.001$), and comorbidities (OR, 0.86; 95% CI, 0.76–0.97; $P=0.018$) were found to be significantly correlated with lower demand (Table 3).
		Moreover, the demand for the improvement of mental health was senificantly higher in patients with arthropathic psoriasis (OR, 1.22; 95% CI, 1.09–1.37; P =0.001) and palmoplantar involvement (OR, 1.09; 95% CI, 1.01–1.18, P =0.027). However, this was lower among patients with older age OR, 0.993; 95% CI, 0.991–0.996, P <0.001), higher BMI (OR, 0.9955; 95% CI, 0.9914–0.9996; P =0.030), a consequence of the constraint o
(b) Report category boundaries when continuous variables were categorized	6	According to the guidelines for the diagnosis and treatment of psoriasis in China (2023), ³⁴ PASI score was categorized as mild (<3), moderate (3 to <10) and severe (\geq 10), whereas BSA (%) are categorized as mild (<3%), moderate (3% to <10%), and severe (\geq 10%). The 5-point IGA categorized the severit evel as clear/almost clear (0/1), mild (2), moderate (3), and severe (4).
(c) If relevant, consider	N/A	N/A ap
		ique

47 of 48		a by copyrigh BMJ Open
	translating estimates of relative risk into absolute risk for a meaningful time period	023-079627 c right, includi
Other 17 analyses	Report other analyses done— eg analyses of subgroups and interactions, and sensitivity analyses	 Impact of psoriasis severity on treatment demands stratified bether COVID-19 pandemic Both multivariable logistic regression and trend tests confirmed that the increasing psoriasis severity, as measured by PASI, significantly stimulated patients' primary treatment demands of psaling skin lesions rapidly (odds ratio [OR], 145; 95% confidence interval (CI), 127–163; <i>P</i> <0.001 for sever pASI versus mild PASI; and OR, 1.02; 95% CI, 1.02–1.03; <i>P</i> <0.001 and the trend test) during a normal period withou COVID-19 lockdown (shown in Fig. 1a–b; and Table S4 (Supplent and Material)). The disease severity-triggered primary treatment demands further increased during the COVID-19 and mproving mental health (CR, 2.19; 95% CI, 1.57–3.05 for sever PASI versus mild PASI; 2.201) and improving mental health (OR, 2.82) 95% CI, 2.24–3.55 for severe PASI versus mild PASI, P <0.001), and improving mental health (OR, 2.82) 95% CI, 2.24–3.55 for severe PASI versus mild PASI, P <0.001), and improving mental health (OR, 2.82) 95% CI, 2.24–3.55 for severe PASI versus mild PASI, P <0.001), and thereatment side effects, were also significantly stimulated by deteriorated skin conditions measure with the statistical insignificance (both <i>P=</i>0.064 the heterogeneity Q-test). Other treatment demands, including reducing the reatment side effects, were also significantly stimulated by deteriorated skin conditions measure with a scenetion was the demand for reducing relapses, which significantly declined as PAST indexased. Nevertheless, the magnitude of this decline decreased during the pandemic lockdown (OR, 0.61; 95% CI, 0.55 P <0.001 for severe PASI versus mild PASI (all <i>P</i> =0.196 during a COVID-19 lockdown; heterogeneity 0-test, <i>P=</i>0.001; shown in Fig. 1.17 Impact of psoriasis severity by different instruments on treatment demands of rapidly healing skin lesions hardly changed during the pandemic lockdown (OR, 1.33; 95% CI, 1.57 P <0.001 for severe PASI versus mild PASI (all <i>P</i> =0.051 for and <i>P</i> <0.0
DiscussionKey results18	Summarise key results with	10 In this cross-sectional study, it was observed that patient demands for healing skin lesions and improving mental hea
	reference to study objectives	significantly increased as psoriasis worsened, especially during the CO ID-19 pandemic. Different psoriasis severity measures have different emphases in reflecting patients' treatment demands, which were magnified during the pandemic. The impact of disease severity on most treatment demands was mediated by deteriorated quality of life, peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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				except for the demands of rapid skin healing and relapse reduction treatment demands were also examined.		Chus other factors that stratified major
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13	Although, to our knowledge, this study is the largest real-world st patients with psoriasis during the pandemic lockdowns, there wer enrolled patients from specific dermatological clinics, and a certa request. Thus, the study population may not represent the general improving mental health was collected as a binary variable, while systematically assessed using specialized scales, such as Generali Questionnaire-2 and Short Form-12 Health Survey. ^{11 22 46} Further patients' mental health condition and the degree of each treatmen issue regarding the missing data for this data platform. However, random was considered (Table S2 [Supplemental Material]), a co handling missing data and, therefore, used. Fourth, since the infor COVID-19 pandemic information was matched to each patient or prevented with a precise approach in China.	ig for 账金 如泉ed to textained tai	nitations. First, the Psoriasis Center program oportion of patients declined the enrollment is population. Second, the demand for psychological or psychiatric condition was no existing provider-2, Patient Health are warranted to quantitatively investigate hand using specialized scales. Third, there was consisting rate was not high, and missing at case analysis was considered sufficient for on residence place was not collected, the pprovince level, even though the pandemic v
Interpretatio n	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13	An increase in psoriasis severity significantly stimulates patients' and improving mental health aspects, especially during the pande pathway for patients with psoriasis getting more intensive treatmen better recognize and meet patients' treatment demands during the the psychological needs of patients, while IGA should be used to demographic and clinical characteristics of each patient should al strategy during future pandemics. Moreover, since the COVID-19 results of this study could provide hints for personalized treatmen pandemic lockdowns.	nining pance pance refigine solution	kekdowns, indicating the need for an accessil memtal support during future pandemics. T demic, we suggest that BSA is used to determ the desire to quickly heal lesions. Other econsidered for a more personalized treatmen demic is nearing its end in many countries, th
Generalisabi lity	21	Discuss the generalisability (external validity) of the study results	13	Moreover, since the COVID-19 pandemic is nearing its end in ma hints for personalized treatment for patients with non-fatal chroni	d u <u>wy</u> c c malis ar	eases in future pandemic lockdowns.
Other informa	tion				tech	<u>с</u>
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14	This work was supported by the National Key Research and Deve PKU-Baidu Fund (grant number: 2020BD012). The funders had a collection, management, analysis, and interpretation of the data; p and decision to submit the manuscript for publication.	n e ro n e pa	No in the design and conduct of the study;
*Give informat	ion sep	parately for cases and controls in c	case-cor	ntrol studies and, if applicable, for exposed and unexposed groups ir		Ce B
		Fc	or peer i	10 review only - http://bmjopen.bmj.com/site/about/guidelines.xhtn	٦l	que de l

Page 49	9 of 48 BMJ Open	mjopen-2023- 1 by copyrigh
$1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 24 \\ 25 \\ 26 \\ 27 \\ 28 \\ 29 \\ 30 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 31 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 31 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 31 \\ 31 \\ 32 \\ 33 \\ 34 \\ 35 \\ 36 \\ 37 \\ 38 \\ 39 \\ 40 \\ 41 \\ 42 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 31 \\ 3$	Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published es checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedici http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www	virght, and so f transparent reporting. The STROBE statement.org. 2023-064, Annals of Internal Medicine at condectore-statement.org. 17 February 2024. Downloaded from http://bmjopen.bmj.com/ on June 8, 2025 at Agence Bibliographique Enseignement Superieur (ABES) . 2010 State
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