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Psoriasis and addiction: assessing mental health based on a cross-sectional study in Germany

Background: Psoriasis is a chronic skin disease with a high mental burden. Well-known comorbidities include depression, anxiety, as well as alcohol and tobacco addiction, however, there is barely any evidence on other addictions. *Objectives:* The aim of this study was to estimate the prevalence of the six most common addictions among psoriasis patients in Germany and to determine associated clinical factors. *Materials & Methods:* Dermatologists working in four dermatological clinics and 32 practices across Germany recruited patients between September 2018 and November 2019. This cross-sectional study contained questionnaires on six addictions, depression, anxiety, and the Dermatology Life Quality Index (DLQI). In addition, scores for the Psoriasis Area and Severity Index (PASI) were obtained by physicians. *Results:* Overall, 502 patients (43.4% women; mean age: 49.7 ± 14.6 years) were included. Positive addictions were found in 30.3% for daily smoking, 8.6% for alcohol, 1.2% for gambling, 3.8% for internet use, 3.6% for food, and 6.0% for drugs. Younger age was associated with a higher probability of addiction except for alcohol dependency. The PASI was only significantly associated with smoking. *Conclusion:* Addictions seem to be common among psoriasis patients. Further research should include comprehensive data and control groups, furthermore, standardised screenings and early referrals could represent first steps to improve people-centred healthcare for patients with psoriasis.

Key words: addiction medicine, comorbidity, epidemiology, mental health, psoriasis

Psoriasis is a chronic inflammatory systemic skin disease associated with typical cutaneous manifestations, affecting 0.5-11.4% of the global population and 2.1% of the German population [1]. It is often accompanied by comorbidities such as cardiovascular, rheumatoid, and mental diseases [2]. Mental diseases are particularly significant in psoriasis, as psoriasis lesions often affect visible body areas or the genital area, causing stigmatisation [3, 4] and impairment of patients' quality of life, happiness, and sex life [5-7]. Comorbid mental diseases include depression, anxiety, suicidality, and various addictions [8-13]. Addictions such as alcohol consumption and smoking are commonly investigated [10, 11], whereas data on other addictions such as gambling and drug abuse are rare [12].
To improve patients' quality of life, early detection of these comorbidities is essential. However, comorbidities often remain unrecognised [14-16]. Consequently, there is a great need for improvement to reach the goals outlined in the 'Global report on psoriasis' issued by the World Health Organisation (WHO) in 2016 [17]. This report emphasises the need for people-centred care and multidisciplinary approaches in order to minimise the burden that individuals suffer due to psoriasis. When psoriasis is treated sufficiently, a reduction of disease severity has been shown to be associated with an improvement in quality of life and decrease in depressive symptoms [8, 18-20]. Since patient-physician time is limited and limited information on risk factors for mental comorbidities is available, screening for mental comorbidities is advocated in the literature [20, 21]. While some clinical risk factors for depression and anxiety are available [20-23], currently there is no evidence on risk factors for addictions.
Therefore, the aim of this study was to estimate the prevalence of the six most common addictions in Germany in patients with psoriasis and to determine clinical factors associated with the occurrence of each addiction, respectively.

Materials and methods

Study population

For this cross-sectional, paper-based, non-interventional study, participants were recruited from 32 dermatological practices and four dermatological clinics across Germany between September 2018 and November 2019. Dermatologists were invited using data from the German psoriasis physician network 'Psoriasis Praxisnetz Süd-West e.V.'.

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If physicians agreed to participate, they received material to include up to 10 patients. Additional patient sets for inclusion were provided on demand. For study participation, patients had to fulfil the following inclusion criteria: age ≥18 years, diagnosed with psoriasis, able to provide written informed consent, and able to answer a German questionnaire. To minimise selection bias, dermatologists were asked to include either (1) the first 10 psoriasis patients willing to participate after the start of recruitment or (2) patients who visited within the last two months retrospectively and consecutively. Informed consent was obtained from every participant prior to inclusion. The study and all procedures were reviewed and approved by the local ethics committee of the medical faculty of the Technical University of Munich (Reference 485/17 S).

Questionnaire

Participants received a questionnaire consisting of the German versions of nine well-established questionnaires for the assessment of mental health status. A detailed description of each instrument can be found in the supplementary material and *table 1*. Dermatologists additionally documented patient characteristics including age, sex, body mass index (BMI), and disease severity measured by the Psoriasis Area and Severity Index (PASI).

Statistics and data management

Study size was limited by a patient recruitment time of one year in order to reduce potential seasonal influences. Descriptive data were generated for general patient characteristics and prevalence of mental disorders. Mental health outcomes for prevalence estimation and further analyses were defined by thresholds listed in *table 1*. To test differences between sex, t-test, chi-squared test, or Fisher's exact test were used. Furthermore, logistic regression models were calculated to determine personal and clinical factors (age, sex, BMI, Dermatology Life Quality Index (DLQI), PASI, and positive screening for depression and anxiety) that were associated with the occurrence of one of the six addictions. Variables were added to multivariate regression models using backward stepwise selection to minimise multicollinearity. Odds ratios (OR) and adjusted OR (aOR) were calculated with the respective 95% confidence intervals (CI). Global alpha was set at 0.05. To improve the quality of the regression models, multiple imputations were conducted. Therefore, a fully conditional specification method was used to impute missing data. In total, five imputations were generated to calculate missing data ($n = 193$; 3.0%). Afterwards, a sensitivity analysis was performed to compare the results of the multiple imputation analysis with those of the complete cases (*i.e.,* only cases without any missing data; *supplementary table 1*). All data were entered twice and compared in order to detect discrepancies. In case of error, source data were accessed and datasets were corrected. IBM SPSS Statistics (Version 25, IBM Corporation, Armonk, NY, USA) was used for all analyses.

Results

Patient characteristics

A total of 502 participants were included in this study. The mean age was 49.7 years (±14.6 years) and 218 (43.4%) were women. The mean BMI was 28.1 (±5.4) and the mean PASI was 7.3 (±7.6). Mean DLQI was 7.5 (±7.1), with significantly greater impairment in women than in men (8.4 ± 7.3 vs. 6.8 ± 7.0, $p = 0.020$). Nearly half of all patients (44.8%) reported no or a small effect of psoriasis on their daily life, whereas 27.1% reported a large or extremely large impact. Overall, 29.5% of individuals screened positive for depression, with 11.4% indicating major depression. Anxiety was found in 48.8% of patients, with 17.5% having signs for an anxiety disorder (*figure 1*). Women were more likely to be positive for depression (35.8% vs. 24.7%, $p = 0.006$) and anxiety disorder than men (20.1% vs. 14.8%; $p < 0.001$) (*table 2*).

Prevalence of addictions

A total of 152 participants (30.3%) reported daily cigarette smoking, with no significant difference between women and men (33.0% vs. 28.2%, $p = 0.216$) (*table 2*). The mean duration of daily smoking was 24.2 years (±13.1 years). Of those who were smoking daily, 55.3% ($n = 84$) stated that they smoked less than a pack per day, 34.9% ($n = 53$) one pack per day, and 9.9% ($n = 15$) more than a pack per day. Additionally, 8.6% ($n = 43$) of all patients screened positive for alcoholism, with a higher proportion in men than women (11.3% vs. 5.0%, $p = 0.020$). A sex difference was also observed regarding addiction of gambling as only men were positive for this (2.2% of men vs. 0% of women, $p = 0.039$). For all other addictions, no sex difference was found. Overall, 3.8% ($n = 19$) of the patients showed pathological internet behaviour and 2.0% ($n = 10$) had borderline to pathological internet use. Around 3.6% ($n = 18$) of the patients screened positive for food addiction. Furthermore, 15.0% ($n = 75$) of the participants displayed at least a low level of abusive behaviour regarding drugs, with positive screening for drug abuse in 6.0% ($n = 30$) (*figure 1*). Considering all addictions, 36.9% ($n = 185$) of patients screened positive for at least one addiction, with no significant difference in sex (women: 37.6% vs. men: 36.2%, $p = 0.200$). However, considering the number of addictions, women were more likely to have one addiction (30.7% vs. 24.3%), while men were more likely to have two or more addictions (11.9% vs. 6.9%, $p = 0.013$) (*table 2*).

Addiction-associated factors

With the exception of alcohol dependency, younger age was associated with a higher chance of having all addictions. Therefore, age had the strongest influence on pathological gambling (aOR after multiple imputation [aOR_{MI}] = 0.93, 95% CI: 0.87-1.00) and drug addiction ($aOR_{MI} = 0.94$, 95% CI: 0.92-0.97) (*figure 1*). Additionally, PASI was associated with smoking ($aOR_{MI} = 1.04$, 95% CI: 1.01–1.07). For example, a 10-point increase in PASI was associated with a 40% increase in smoking. Furthermore, depression was significantly associated with alcohol ($aOR_{MI} = 2.66$, 95% CI: 1.40-5.01) and drug addiction ($aOR_{MI} = 2.66$,

Table 1. Standardised questionnaires included in the study.

Questionnaire	Abbreviation	Number of questions	Scale	Possible answers (value)	Range	Classification
Dermatology Life Quality Index	DLQI	10	ordinal[a]	[] very much (3) [] a lot (2) [] a little (1) [] not at all (0) [] not relevant (0)	0-30	[0-1] no effect at all on patient's life [2-5] small effect on patient's life [6-10] moderate effect on patient's life [11-20] very large effect on patient's life [21-30] extremely large effect on patient's life
WHO-Five Well-Being Index	WHO5	5	ordinal	[] at no time (0) [] some of the time (1) [] less than half of the time (2) [] more than half of the time (3) [] most of the time (4) [] all of the time (5)	0-100	[100-51] good wellbeing [50-29] depressive tendency/depression* [28-0] potentially major depression*
Generalized Anxiety Disorder 7-item	GAD-7	7	ordinal	[] not at all (0) [] several days (1) [] >half the time (2) [] nearly every day (3)	0-21	[0-4] good wellbeing [5-9] mild anxiety [10-14] moderate anxiety* [15-21] severe anxiety*
CAGE questionnaire	CAGE	4	binominal	[] yes (1) [] no (0)	0-4	[0-1] no drinking problem [2-4] alcohol addiction*
Gamblers Anonymous 20 Questions	20Q	20	binominal	[] yes (1) [] no (0)	0-20	[0-6] no gambling problem [7-20] compulsive gambling*
Compulsive Internet Use Scale	CIUS	14	ordinal	[] never (0) [] seldom (1) [] sometimes (2) [] often (3) [] very often (4)	0-56	[0-17] not problematic [18-20] borderline [21-56] pathological internet use*
Modified Yale Food Addiction Scale 2.0	mYFAS 2.0	13	ordinal	[] never (0) [] less than once a month (1) [] once a month (2) [] 2-3 times per month (3) [] once a week (4) [] 2-3 times per week (5) [] 4-6 times per week (6) [] daily (7)	0-11[b]	[0-1] no eating disorder [2-3][c] mild eating disorder* [4-5][c] moderate eating disorder* [6-11][c] severe eating disorder*
Drug Abuse Screening Test	DAST-10	10	binominal	[] yes (1) [] no (0)	0-10	[0] no problem indicated [1-2] low level [3-5] moderate level* [6-8] substantial level* [9-10] severe level*

**Considered clinically significant[a] Question 7 differs and is a combination of binominal and ordinal scales.[b] Each item has an individual classification of present (1) or not (0). Range over all items for being present (1) is from 2-7 to 5-7, respectively.[c] Plus items for impairment or distress which were completed if present at least 2-3 times per week.*

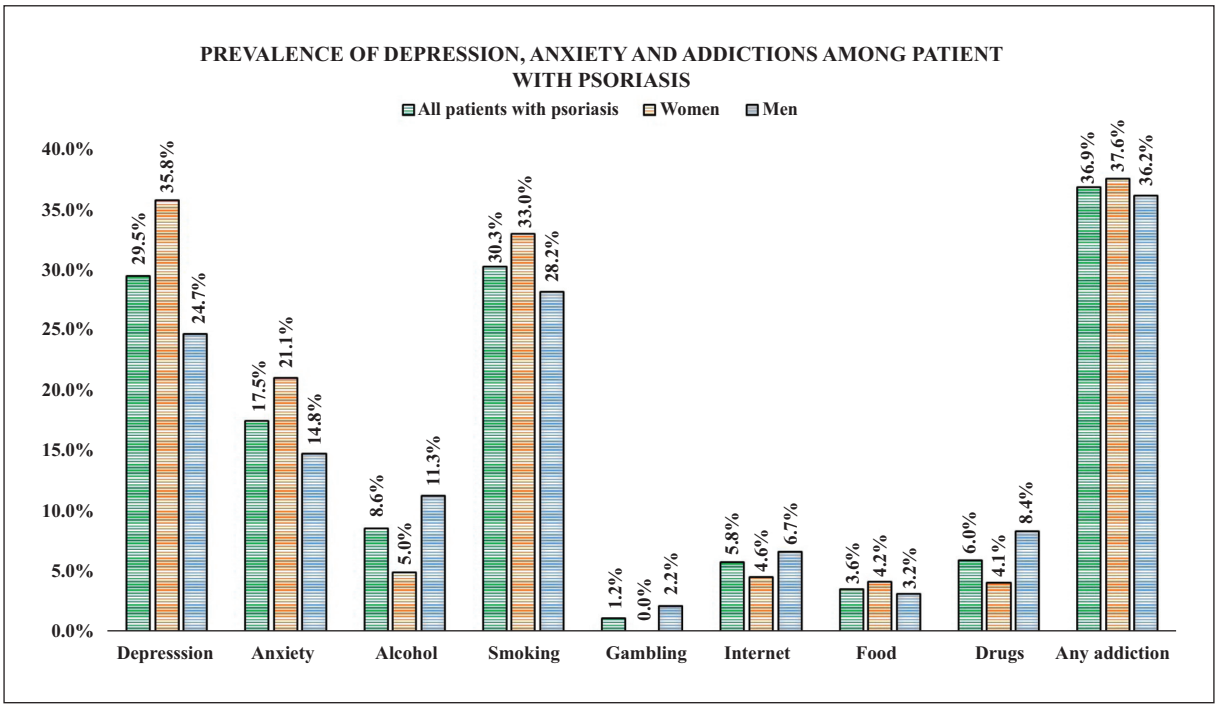

Figure 1. Prevalence of depression, anxiety and the six most common addictions in Germany (smoking, alcohol, gambling, internet use, food, and drugs), stratified by gender.

95% CI: 1.23-5.77), whereas internet use ($aOR_{MI} = 7.66$, 95% CI: 2.92-19.98) and food addiction ($aOR_{MI} = 3.03$, 95% CI: 1.10-8.36) were more common in patients who had an anxiety disorder (*figure 2*, *supplementary table 1*).

Discussion

The aim of this study was to provide evidence on the estimated prevalence of six addictions in patients with psoriasis as well as to identify associated clinical factors. Overall, mental burden was high in patients with psoriasis and there was a high prevalence of addiction with nearly half of the patients reporting signs of at least one addiction. In particular, internet addiction was surprisingly high in the study population. Younger age was associated with a higher chance of most addictions.

Comparison with the general population

The study indicates that psoriasis patients have a greater likelihood of several addictions compared to representative samples of the German general population, including daily smoking (30.3% vs. 15.1%) [24], alcohol dependency (8.6% vs. 3.1%) [24], pathological gambling (1.2% vs. 0.2%) [25], and legal or illegal drug abuse (6.0% vs. 3.2%-5.2%) [24]. The increased mental burden due to skin diseases and social withdrawal might play important roles in this association [13, 26]. Despite the higher BMI in this sample compared to the general population (28.1 vs. 26.7), food addiction was found to be less prevalent among patients with psoriasis (3.6% vs. 7.9%) [27], although the logistic regression revealed a positive association with BMI. This difference is therefore unlikely to be related to excessive eating but may be related to a social desirability bias. Internet addiction is reported to decrease with increasing age [28, 29]. However, pathological internet use was higher in this study (3.8%) with a mean age of 49.7 years, compared to a study including a representative sample of German adolescents with a mean age of 14.9 years (3.2%) [30]. Another study performed by Rumpf *et al*. assessed internet addiction among more than 8,130 German individuals, who had a mean age of 39.9 years and used the internet regularly [28]. When adjusted to the cut-off used by Rumpf *et al*., the prevalence of internet addiction was equal (1.5%), although this study population was older. Thus, the study may indicate an association between internet addiction and psoriasis, however, further investigation is required.

Comparison with other studies of individuals with psoriasis

The proportion of psoriasis patients that currently smoke varies widely in the literature, ranging from 14.0% to 51.3% [10]. Although the prevalence detected in this study was within this range, it was lower compared to that reported in another German study among psoriasis patients (30.8% vs. 41.0%) [12]. In a systematic review, the prevalence of alcohol addiction was reported to be between 11.1% and 28.0% in psoriasis patients [11], which is higher than that reported in this study. Studies using the same questionnaire tool as that used in this study included 60 and 102 patients with a prevalence of 18.3% and 13.5%, respectively [12, 31]. Although the prevalence of alcohol addiction was lower in this study compared to most previous studies, the prevalence exceeds the rate within the general German population (3.1% [24]).

Table 2. General characteristics of participants stratified by sex. Differences were compared using the unpaired t-test and Chi square test.

		Total ($n = 502$)	Women ($n = 218$)	Men ($n = 284$)	p value
Age [Mean ± SD]		49.7 ± 14.6	50.7 ± 14.8	48.9 ± 14.4	0.164
BMI [Mean ± SD]		28.1 ± 5.4	28.3 ±6.5	28.0 ± 4.3	0.594
PASI [Mean ± SD]		7.3 ± 7.6	6.7 ± 6.8	7.8 ± 8.1	0.098
DLQI [Mean ± SD]		7.5 ± 7.1	8.4 ± 7.3	6.8 ±7.0	**0.020**
Depression [*n* (%)]	No	351 (69.9)	139 (63.8)	212 (75.2)	**0.006**
	General	91 (18.1)	43 (19.7)	48 (17.0)	
	Major	57 (11.4)	35 (16.1)	22 (7.7)	
	Missing	3 (0.6)	1 (0.5)	2 (0.7)	
Anxiety [*n* (%)]	No	248 (49.4)	84 (38.5)	164 (57.7)	< **0.001**
	Mild	157 (31.3)	83 (38.1)	74 (26.1)	
	Moderate	68 (13.5)	36 (16.5)	32 (11.3)	
	Severe	20 (4.0)	10 (4.6)	10 (3.5)	
	Missing	9 (1.8)	5 (2.3)	4 (1.4)	
Daily smoking [*n* (%)]	Yes	152 (30.3)	72 (33.0)	80 (28.2)	0.216
	No	343 (68.3)	142 (65.1)	201 (70.8)	
	Missing	7 (1.4)	4 (1.8)	3 (1.1)	
Years of smoking [Mean ± SD]		24.2 ± 13.1	25.3 ± 13.3	23.3 ± 12.9	0.355
Alcohol [*n* (%)]	Yes	43 (8.6)	11 (5.0)	32 (11.3)	**0.020**
	No	444 (88.4)	195 (89.4)	249 (87.7)	
	Missing	15 (3.0)	12 (5.5)	3 (1.1)	
Gambling [*n* (%)]	Yes	6 (1.2)	0 (0.0)	6 (2.1)	**0.039***
	No	481 (95.8)	210 (96.3)	271 (95.4)	
	Missing	15 (3.0)	8 (3.7)	7 (2.5)	
Internet use [*n* (%)]	No	449 (89.4)	195 (89.4)	254 (89.4)	0.583
	Borderline	10 (2.0)	4 (1.8)	6 (2.1)	
	Pathological	19 (3.8)	6 (2.8)	13 (4.6)	
	Missing	24 (4.8)	13 (6.0)	11 (3.9)	
Food [*n* (%)]	No	475 (94.6)	205 (94.0)	270 (95.1)	0.423
	Mild	7 (1.4)	5 (2.3)	2 (0.7)	
	Moderate	4 (0.8)	1 (0.5)	3 (1.1)	
	Severe	7 (1.4)	3 (1.4)	4 (1.4)	
	Missing	9 (1.8)	4 (1.8)	5 (1.8)	
Drugs [*n* (%)]	No	406 (80.9)	174 (79.8)	232 (81.7)	0.484
	Low level	45 (9.0)	22 (10.1)	23 (8.1)	
	Moderate level	18 (3.6)	5 (2.3)	13 (4.6)	
	Severe level	8 (1.6)	2 (0.9)	6 (2.1)	
	Substantial level	4 (0.8)	2 (0.9)	2 (0.7)	
	Missing	21 (4.2)	13 (6.0)	8 (2.8)	

Table 2. (*Continued*).

		Total ($n = 502$)	Women ($n = 218$)	Men ($n = 284$)	p value
Addictions [n (%)]	None	250 (49.8)	95 (43.6)	155 (54.6)	**0.013**
	One	136 (27.1)	67 (30.7)	69 (24.3)	
	Two	36 (7.2)	14 (6.4)	22 (7.7)	
	Three or more	13 (2.6)	1 (0.5)	12 (4.2)	
	Missing	67 (13.3)	41 (18.8)	26 (9.2)	

**Fisher's exact test was used as the requirements for the Chi square test were not fulfilled.SD: standard deviation; BMI: body mass- index; DLQI: Dermatology Life Quality Index; PASI: Psoriasis Area and Severity Index. Significant results are presented in bold.*

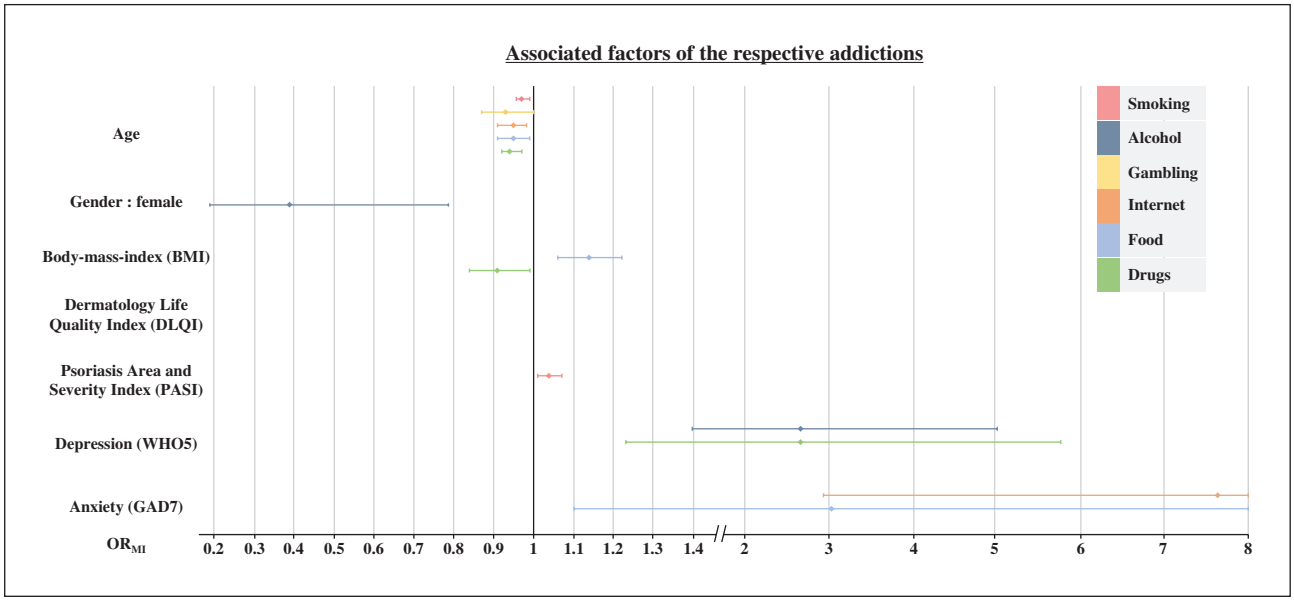

Figure 2. Personal and clinical factors associated with each addiction.
BMI: body-mass index; DLQI: Dermatology Life Quality Index; PASI: Psoriasis Area and Severity Index; WHO5: WHO-Five Well-Being Index; GAD-7: Generalized Anxiety Disorder 7-item.

The prevalence of internet addiction was lower compared to another study including individuals with psoriasis who were reached via online self-help groups (8.5%) [26]. As the prevalence is reported to be higher in people with psoriasis compared to patients with psoriasis, the results underline the importance of a people-centred care, as demanded by the WHO [17].

When considering the other addictions examined, data are limited to one study including 102 patients from a single university hospital [12]. The authors found higher rates for compulsive gambling (2.0% vs. 1.2%), but a lower rate for food (3.1% vs. 3.6%) and drug addiction (1.0% vs. 2.4%; threshold adapted to Zink *et al.*) compared to this sample [12]. As there were no considerable differences regarding age and severity of psoriasis, the different findings emphasise the need for further clarification and research to potentially include data extracted from health insurance registries.

Addiction-associated factors

The individual and clinical factors associated with all six addictions have not been previously investigated. The multiple regression models reveal that for most of the addictions, younger age had a significant influence. Although the discussion on age and addiction within the current literature is highly controversial [32, 33], what stands out for all addictions, expect alcohol addiction, is that the chance of having an addiction significantly decreases with increasing age. Based on backward selection, only daily smoking was associated with a higher PASI. This might either indicate the absence of a classic dose-response relationship or that conventional strategies to classify disease severity in a cross-sectional manner might not comprehensively reflect the individual burden experienced by patients [34]. Furthermore, all addictions apart from smoking and gambling were associated with depression or anxiety, which is in accordance with the literature [35]. These findings strengthen the

reliability of the study results. However, no specific clinical factor can be identified as a potential predictor even though their prevalence was higher than in the general population. Therefore, the findings also emphasise the need for further research and standardized screening.

Strengths and limitations

A major strength of this study is the strict set of criteria for consecutive inclusion of patients that was applied to reduce selection bias. Additionally, recruitment was carried out in 36 medical settings throughout Germany. There are some study limitations, however. First, there is a potential for data and selection bias as participation for dermatologists was voluntary and this can lead to a self-selected subgroup of dermatologists. Second, screening for addictions was performed using standardised questionnaires without a corresponding control group, thus comparisons are only indirect. Although the questionnaires are validated and all showed acceptable results for specificity and sensitivity [3], it should be taken into account that these findings do not represent diagnoses but rather an estimate of the respective outcomes, and provide no valid information on severity of the respective addictions. Third, a certain degree of social and desirability bias should be considered. Patients are not always willing to disclose information regarding sensitive and potentially stigmatising data [36, 37]. Furthermore, no duration or time frame for psoriasis or addiction was documented, therefore the direct or indirect nature of the relationship between the two cannot be addressed.

Conclusion

In conclusion, the prevalence of addictions, especially internet addiction, was high among patients with psoriasis. To further verify the association between the prevalence of addiction and psoriasis, future research should also include a suitable control group or data from health insurance registries. The study findings underline the importance of implementing a routine, relatively rapid assessment of psychological comorbidities when assessing the severity of psoriasis, which could be easily implemented in psoriasis care [21-23]. As different clinical variables were associated with different addictions, a possible first step could include routine and standardised screening as well as referral for early detection and treatment of these psychological disturbances in order to improve the quality of people-centred care. ■

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Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1684/ejd.2021.4146. Table S1: Comparison between complete-case analysis and multiple imputation analysis for clinical factors associated with depression, anxiety or addictions.

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