




ORIGINAL ARTICLE

Satisfaction and attitudes toward systemic treatments for psoriasis: A cross-sectional study

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Abstract

In psoriasis patients, satisfaction and patients' attitude toward treatment are heterogeneous depending on several factors and remain poorly investigated, although the availability of several new targeted therapeutic options. A multicentre cross-sectional investigation was conducted to estimate treatment satisfaction and attitudes (awareness, trust, and therapeutic alliance) in a large population of adult psoriasis patients undergoing a systemic biologic or non-biologic agent for moderate-to-severe plaque-type psoriasis. Patients' satisfaction was measured using the Treatment Satisfaction Questionnaire for Medication II questionnaire and patients' attitudes toward treatment were evaluated using a Lickert scale. Results were related to patients' and treatment characteristics and therapeutic outcomes. The study included 899 psoriasis patients and demonstrated high-treatment satisfaction and positive attitudes toward systemic treatments, with greater influence of the perceived efficacy and the type of treatment. Biologic treatments and, in particular anti-IL17 agents showed higher results. More efforts in developing tools facilitating communication and exploring important aspects of patients' view are needed.

KEYWORDS

biologics, patients' attitudes, psoriasis, treatment satisfaction

1 | INTRODUCTION

Several targeted biological treatments have become available in recent years for the treatment of patients with moderate-to-severe psoriasis.¹ The effectiveness of these agents has been measured extensively with objective outcome measures, particularly the psoriasis area and severity index, and the physician global assessment, as well as measuring how the treatment impacts on patients' quality of life.² However, treatment satisfaction with medications and patients'

attitude toward treatment, including awareness, trust and therapeutic alliance have been poorly investigated for anti-psoriatic treatments.³ Recent studies demonstrated that patients' satisfaction and preferences are heterogeneous and depend on several factors, including patient and disease characteristics, and type of treatment.³⁻⁹ However, when considering all therapeutic options, including topical agents, phototherapy, traditional systemic and biologic drugs, patient satisfaction remains low, leading to concerns about long term adherence and treatment persistence.³⁻⁹ When treating patients with psoriasis, patients' perspective, satisfaction and positive attitude toward treatment should be addressed, as they are positively related to

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effectiveness, adherence to/persistence of treatment, and health-related quality of life.¹⁰⁻¹² Despite the importance, generic treatment satisfaction questionnaires seems insufficient to adequately evaluate treatment satisfaction in psoriasis patients.¹³ In particular, the Treatment Satisfaction Questionnaire for Medication (TSQM) has been developed to gauge satisfaction with medication for different indications,^{14,15} while attitudes are generally measured with a psychometric scale, the Lickert scale, a bipolar psychometric scaling method developed by Lickert in 1932.¹⁶

In the context of the current availability of many treatment options for psoriasis, the objective of this cross-sectional study was to investigate satisfaction and attitudes of patients toward systemic treatments. The results may provide indications to additional treatment benefit.

2 | PATIENTS AND METHODS

A multicentre cross-sectional explorative investigation was conducted to estimate unmet needs of current systemic anti-psoriatic agents by analyzing treatment satisfaction and attitudes in a large population of adult psoriasis patients undergoing a systemic biologic and non-biologic agent for moderate-to-severe plaque-type psoriasis. Patients' satisfaction score toward treatment was measured using the TSQM II questionnaire and patients' attitude toward treatment was evaluated using an attitude scale.¹⁴⁻¹⁷ Influence of patients' characteristics (sex, age, and educational level), treatment characteristics (type, route of administration, frequency, and duration) and treatment outcomes (self-assessed efficacy, self-reported safety perception) on TSQM II scores and attitudes score were also analyzed.

Patients were recruited at three academic centres (University "Cattolica del Sacro Cuore" of Rome, University of Rome "Tor Vergata" and University of Verona) during the period October 2018 to June 2019. All the included subjects were consecutive patients undergoing a systemic treatment for at least 12 weeks with a biologic (adalimumab, certolizumab, etanercept, golimumab, infliximab, ixekizumab, secukinumab, ustekinumab) or a conventional non-biologic treatment (acitretin, ciclosporin, methotrexate and PUVA therapy), following the current recommendations from National guidelines, good clinical practice and Italian prescription criteria for systemic non-biologic and biologic agents.¹⁸

Moreover, patients were able to understand and sign an informed consent and a declaration allowing the use of clinical records for scientific purposes, able to understand and complete the TSQM II questionnaire and the attitude questionnaire.¹⁴⁻¹⁷ Patients meeting any of the following criteria were excluded from participation: (i) pediatric patients, (ii) patients with a concurrent diagnosis of other immunological disorders, (iii) Participation in a clinical trial, and (iv) mentally unable.

Recorded data from subjects included: demographic information (age, sex), education level, treatment characteristics (drug, administration route, and frequency), treatment duration.

A subjective patient evaluation with a visual (11 point) scale was used to register patient perception of improvement from baseline to reach a completely patient-centered consistency of assessment.

Subjective evaluation of clinical improvement (self-reported assessment) expressed by a visual analogic scale from 0 to 10 on disease severity before treatment initiation and at study entrance (Δ -Self reported assessment was calculated by the differential value from self-reported disease severity at baseline and at study entrance) and self-reported occurrence of side effects were registered. The TSQM II covers four domains of satisfaction with medications: efficacy, convenience, general satisfaction, and side effects. The scores for each domain range from 0 (extremely dissatisfied) to 100 (extremely satisfied) adding to a total score of 0 to 400. The questionnaire refers to 2 to 3 weeks prior to completion of the questionnaire. The Italian version of TSQM II validated by Quintiles has been used for this study.¹⁷ The attitude questionnaire based on a psychometric Lickert scale explored three domains (trust, awareness, therapeutic alliance): two items regarding trust in medication and physician (score 0-10), eight items investigating awareness (score 0-40), and two items exploring therapeutic alliance (0-10) (Table 1). For each question, the positive attitude level was rated on a Lickert scale scoring from 0 (complete disagreement) to 5 (complete agreement).¹⁴ For each question/sentence, patients were invited to answer as best represents personal view toward the statement presented in the question or sentence.

A group of experts used a consensus panel process to generate the items (six dermatologist and one psychologist). A collection of commonly discussed questions, concerns and beliefs from patients in routine practice was performed and categorized as items expressing concept of trust, awareness and alliance; expert agreed that the questionnaire content was valid and experience-based on the basis of a personal (min > 15 years' experience) in psoriasis treatment.

Patients' interviews were performed by a trained psychologist to a number of 30 consecutive psoriasis patients referring to the out-patient clinics, in order to perform identification of ambiguous items, questions were corrected and minor changes in wording were made based on their comments to obtain a simple patient-oriented instrument.

Sensible data, including name or any identifying records, of patients accepting to participate to the study were anonymized. Ethical approval was obtained from the ethical committee of the University Hospital of Verona (protocol number: 1358CESC).

3 | STATISTICAL METHODS

Each variable was analyzed using descriptive statistics (number and percentage for categorical variables and mean \pm SD or median with range for continuous variables, when appropriate). The TSQM II score and the attitude values were evaluated according to patients' characteristics (sex, age, and educational level), treatment regimen (type, administration route, frequency, and duration) and treatment outcomes (self-assessed efficacy, self-reported safety perception). Moreover, treatment satisfaction and attitudes were also compared among patients who were treated with biologic agents according to the pharmacological class (anti-TNF alpha, anti-IL17, and anti IL12/23) and between each drug. Statistical differences between variables were calculated using the Fisher or the Chi-square test for categorical

TABLE 1 Attitude toward treatment attitudes questionnaire. (Likert scale)

		Strongly agree/agree/neutral/ disagree/strongly disagree
1. Trust	I feel confident that this treatment is appropriate for my personal disease condition	From 5 to 1
2. Trust	I have trouble accepting the need to undergo a therapy in a semi-continuous or continuous basis in order to be cleared from psoriasis	From 1 to 5
3. Awareness	I have requested and received satisfactory information on treatment, particularly about efficacy against psoriasis	From 5 to 1
4. Awareness	I feel secure about medication safety because I have had time and opportunity to clarify any doubt about safety	From 5 to 1
5. Awareness	Treatment for psoriasis helps me to prevent health complications caused by psoriasis	From 5 to 1
6. Awareness	Treatment for psoriasis improves my quality of life	From 5 to 1
7. Awareness	It is hard for me to explain to others and make them understand what is psoriasis	From 1 to 5
8. Awareness	It is hard for me to explain to others and make them understand what kind of treatment I've been prescribed	From 1 to 5
9. Awareness	Route of administration of the current drug (specify: Oral, IM, IV or SC) satisfies me and improves my adherence to treatment	From 5 to 1
10. Awareness	I have problems complying with my psoriasis treatment due to its administration route (specify: Oral, IM, IV or SC)	From 1 to 5
11. Alliance	Physicians and psoriasis patients should agree on the prescription modalities according to patient lifestyle to treat the disease	From 5 to 1
12. Alliance	I agree with the psoriasis treatment proposed by the dermatologist	From 5 to 1

variables or the Student's *t*-test, the Mann-Whitney test or Kruskal-Wallis test for continuous variables, as appropriate; correlations were performed with Spearman test. All the variables statistically significant in the univariate model were included in the multivariate analysis, performed by stepwise logistic regression. The confidence intervals (CI) were calculated with coverage of 95%. The results were considered statistically significant at $P < .05$. Statistics were performed by IBM-SPSS Statistics v. 25 software (Chicago, Illinois).

4 | RESULTS

4.1 | Study population

The study included 899 patients, 537 males (59.7%) and 362 females, with a mean age of 53.8 years (SD 14.8 years). Educational level was high school/university degree in 454 (50.5%), whereas the

information was missing in 301 patients (33.5%). At the time of the study, 606 (67.4%) patients were under treatment with biologic and 293 (32.6%) were on non-biologic treatment; mean treatment duration was 26.9 weeks (± 27.6 SD). Subcutaneous (s.c.) administration was the most frequent treatment modality reported by 735 (81.8%) patients, followed by oral administration in 121 (13.5%) and intravenous (i.v.) administration in 43 (4.8%). Self-reported assessment of disease severity before treatment initiation was 6.92 (± 2.2 SD) while at study entrance was 0.79 (± 1.5 SD).

Results of the total TSQM score was 334.2 (± 62.8), with effectiveness mean score of 76.8 (± 23.4), side effects mean score of 97.3 (± 11.7), convenience mean value of 81.1 (± 18.5), and global satisfaction mean value of 79.0 (± 22.1). The attitude questionnaire showed high scoring, in particular the trust mean value was 8.3 (± 1.7), the awareness mean value was 33.5 (± 4.7) and the therapeutic alliance mean value was 8.9 (± 1.3). Patients characteristics, drug usage and results of TSQM and attitude questionnaires are summarized in Table 2.

TABLE 2 Demographic and clinical characteristics of patients and questionnaires results

Characteristics		Patients N = 899 (%)
Sex	M	537 (59.7)
	F	362 (40.3)
Age (years)	Mean \pm (\pm SD)	53.8 (\pm 14.8)
	Median (range)	54
Educational level	Primary/secondary	144 (16.0)
	College/university	454 (50.5)
	Missing	301 (33.5)
Drug	Methotrexate	196 (21.8)
	Ciclosporin	84 (9.3)
	Acitretin	27 (3.0)
	PUVA therapy	0 (0)
	Adalimumab	128 (14.2)
	Certolizumab	25 (2.8)
	Etanercept	152 (16.9)
	Ixekizumab	63 (7.0)
	Infliximab	43 (4.8)
	Golimumab	7 (0.8)
	Secukinumab	113 (12.6)
	Ustekinumab	75 (8.3)
	Biologic	606 (67.4)
	Non-biologic	293 (32.6)
	Treatment duration (months)	Mean (\pm SD)
Median (range)		18 (0-156)
Administration route	Subcutaneous	735 (81.8)
	Oral	121 (13.5)
	i.v Intravenous	43 (4.8)
Self-reported assessment of severity before treatment initiation	Mean (\pm SD)	6.92 (2.2)
	Median (range)	7 (0-24)
Self-reported assessment of severity at study entrance	Mean (\pm SD)	0.79 (01.5)
	Median (range)	0 (0-10)
Δ -Self-reported-assessment	Mean (\pm SD)	6.13 (2.5)
	Median (range)	6 (-5 to 24)
Adverse events	Mean (\pm SD)	0.093 (\pm 0.49)
	0	844 (93.9)
	1	47 (5.2)
	4	3 (0.3)
	5	5 (0.6)
Adverse events time of occurrence	Mean (\pm SD)	5.27 (\pm 1.9)
Attitude questionnaire	Trust (mean value \pm SD)	8.3 (\pm 1.7)
	Awareness (mean value \pm SD)	33.5 (\pm 4.7)
	Alliance (mean value \pm SD)	8.9 (\pm 1.3)
TSQM II	Effectiveness (mean \pm SD)	76.8 (\pm 23.4)
	Side effects (mean \pm SD)	97.3 (\pm 11.7)
	Convenience (mean \pm SD)	81.1 (\pm 18.5)
	Global satisfaction (mean \pm SD)	79.0 (\pm 22.1)
	Sum (mean \pm SD)	334.2 (\pm 62.8)

4.2 | Effects of sociodemographic features, treatment characteristics, and self-reported treatment outcomes

4.2.1 | Sociodemographic features

Results showed that TSQM value was significantly higher in men as compared with women ($P = .002$) and in patients with a higher educational level ($P < .001$) but inversely related with age (rho Spearman = -0.086 ; $P = .010$). In terms of trust, patients' answers to items showed significantly higher values in men as compared with women ($P = .025$), absence of significance for age (rho Spearman = -0.062 ; $P = .062$), and higher values in patients with higher educational level ($P = .006$).

Patients' answers exploring awareness showed significantly higher values in men as compared with women ($P < .0001$), absence of significance for age (rho Spearman = -0.026 ; $P = .436$), and higher values in patients with a higher educational level ($P = .001$). Besides alliance was not related to sex ($P = .575$) and educational level ($P = .170$) and was inversely correlated with age (rho Spearman = -0.069 ; $P = .038$).

4.2.2 | Treatment characteristics

TSQM was significantly higher in patients treated with biologic as compared with non-biologic ($P < .0001$) and higher for i.v. than for s.c. and oral administration, as demonstrated by median TSQM values (Table 3) ($P < .0001$). TSQM was inversely related with administration frequency (rho Spearman = -0.235 ; $P < .0001$), with higher frequencies associated with lower satisfaction and directly related with treatment duration (rho spearman = 0.220 ; $P < .0001$). In terms of trust, patients showed higher values when treated with biologics as compared with non-biologics ($P < .0001$), and for i.v. administration than s.c. and oral administration (median trust i. v. = 10.0 , s.c. = 9.0 ; oral = 9.0) ($P < .0001$). Trust was inversely related with administration frequency (rho Spearman = -0.195 ; $P < .0001$) with more frequent drug administration associated with lower trust and directly related with treatment duration (rho spearman = 0.194 ; $P < .0001$). Awareness was significantly higher in patients treated with biologics as compared with non-biologic ($P < .0001$) and higher for i.v. administration than s.c. and oral administration (Table 3) ($P < .0001$). Awareness was inversely related with administration frequency (rho Spearman = -0.147 ; $P < .0001$) and directly related with treatment duration (rho spearman = 0.196 ; $P < .0001$). Moreover, alliance was significantly higher in patients treated with biologics as compared with non-biologics ($P < .0001$) and higher for i.v. and s.c. administration, and lower for oral administration (Table 3) ($P < .0001$). Alliance was inversely related with administration frequency (rho Spearman = -0.205 ; $P < .0001$) and directly associated with treatment duration (rho Spearman = 0.170 ; $P < .0001$).

4.2.3 | Self-reported treatment outcomes

TSQM was directly related with self-assessed efficacy (rho Spearman = 0.430 , $P < .0001$), with higher values associated with elevated Δ Self-reported assessment values and inversely associated with occurrence of adverse events (median TSQM in patients without and with adverse events was 350.0 (100.0 - 425.0) vs 250.0 (27.8 - 400.0), respectively) ($P < .0001$). Trust was related with self-assessed efficacy with higher values associated with elevated Δ Self-reported assessment values (rho Spearman = 0.333 , $P < .0001$) and inversely associated with occurrence of adverse events (median trust values in patients without and with adverse events was 9.0 and 8.0 , respectively) ($P < .006$). Awareness was related with self-assessed efficacy with higher values associated with elevated Δ Self-reported assessment values (rho spearman = 0.296) ($P < .0001$) and inversely associated with adverse events occurrence (median awareness values in patients without and with adverse events was 33.0 (21.0 - 40.0) and 32.0 (21.0 - 40.0), respectively) ($P < .028$). Similarly, alliance was related with self-assessed efficacy (rho Spearman = 0.296 , $P < .0001$) and inversely associated with occurrence of adverse events (median alliance values in patients without and with adverse events was of 10.0 (0 - 10.0) and 8.0 (4.0 - 10.0), respectively) ($P < .0001$).

Differences in median values of TSQM, trust, awareness and alliance according to sociodemographic features, treatment characteristics, and self-reported treatment outcomes are indicated in Table 3.

4.2.4 | Multivariate analysis

TSQM

Results showed that the association between TSQM and sex (beta = 0.087 , $P = .003$) and type of drug (biologic vs non-biologic) (beta = 0.138 ; $P < .0001$), self-assessed efficacy (Δ Self-reported assessment) (beta = 0.348 , $P < .0001$), occurrence of adverse events (beta = -0.217 $P < .0001$) remained statistically significant.

Trust

Results showed that trust was dependent on sex (beta = 0.083 ; $P = .008$), biologic treatment (beta = 0.137 , $P = .001$), and particularly on self-assessed efficacy (Δ Self-reported assessment) (beta = 0.301 , $P < .0001$).

Awareness

Results showed that awareness was associated with sex (beta = 0.129 ; $P < .0001$), biologic treatment (beta = 0.089 , $P = .036$) and self-assessed efficacy (Δ Self-reported assessment) (beta = 0.255 , $P < .0001$).

Alliance

Results showed that alliance was dependent on self-assessed efficacy (Δ Self-reported assessment) (beta = 0.241 , $P < .0001$) and occurrence of adverse events (beta = -0.120 ; $P < .0001$).

TABLE 3 Summary of sociodemographic features and treatment characteristics significantly associated with self-reported treatment outcomes on TSQM and attitudes

Variables	TSQM		Likert scale					
	Median value	P	Trust		Awareness		Alliance	
			Median value	P	Median value	P	Median value	P
Sex								
M	350.0 (100.0-425.0)	P = .002	9.0 (3.0-10.0)	P = .025	34.0 (22.0-40.0)	P < .0001	10.0 (0-10.0)	P = .575
F	330.6 (27.8-400.0)		8.0 (3.0-10.0)		32.0 (21.0-40.0)		9.0 (4.0-10.0)	
Educational level*								
Low	311.1 (211.1-400.0)	P < .001	8.0 (3.0-10.0)	P = .006	31.0 (21.0-40.0)	P = .001	9.0 (6.0-10.0)	P = .122
High	327.8 (100.0-400.0)		9.0 (3.0-10.0)		32.0 (22.0-40.0)		9.0 (4.0-10.0)	
Treatment								
Non-biologic	313.9 (27.8-425.0)	P < .0001	8.0 (3.0-10.0)	P < .0001	32.0 (21.0-40.0)	P < .0001	9.0 (6.0-10.0)	P < .0001
Biologic	361.1 (100.0-400.0)		9.0 (3.0-10.0)		34.0 (22.0-40.0)		10.0 (0-10.0)	
Drug route of administration								
Sc	350.0 (100.0-425.0)	P < .0001	9.0 (3.0-10.0)	P < .0001	33.0 (22.0-40.0)	P < .0001	10.0 (6.0-10.0)	P < .0001
Oral	313.9 (27.8-400.0)		8.0 (3.0-10.0)		32.0 (21.0-40.0)		8.0 (4.0-10.0)	
Iv	366.7 (130.6-400.0)		10.0 (4.0-10.0)		34.0 (25.0-40.0)		10.0 (0-10.0)	
Adverse events								
No	350.0 (100.0-425.0)	P < .0001	9.0 (3.0-10.0)	P < .006	33.0 (21.0-40.0)	P = .028	10.0 (0-10.0)	P < .0001
Yes	250.0 (27.8-400.0)		8.0 (3.0-10.0)		32.0 (21.0-40.0)		8.0 (4.0-10.0)	

Abbreviations: Iv, intravenous; Sc, subcutaneous; TSQM, Treatment Satisfaction Questionnaire for Medication.

*Educational level. Low: primary/secondary level, High: college/university level.

4.3 | Comparison among biologic agents

Comparison of questionnaire results among patients treated with biologic agents according to the pharmacologic class (anti-TNF alpha, anti-IL17, and anti IL12/23) showed homogeneous results. TSQM values were significantly higher in patients treated with anti-IL17 compared to other treatments ($P < .0001$). (Figure 1). Trust, awareness and alliance were significantly higher in patients treated with anti-IL17 compared to other treatments ($P < .0001$); (Figure 1).

In details, when we compared drugs in terms of median scores of TSQM, attitudes, also including a parallel evaluation of self-reported treatment outcomes (Δ -Self reported assessment) in patients treated/not treated with each agent, we observed significantly better results for ixekizumab and secukinumab treated patients for all studied outcomes (Table 4), followed by infliximab showing significant results for TSQM, alliance and Δ -Self reported assessment and ustekinumab showing significant values for trust and Δ -Self reported assessment. Treatment with subcutaneous anti TNFs showed worse results, with etanercept demonstrating significant differences only in terms of TSQM and trust, adalimumab only in term of Δ -Self reported assessment and CZP not demonstrating significant differences for any outcome. (Table 4).

5 | DISCUSSION

This study demonstrated high-treatment satisfaction and positive attitude of patients toward systemic treatments with greater influence of the perceived efficacy and the type of treatment. Biologic treatments and, in particular anti-IL17 agents, ixekizumab and secukinumab, showed better results in terms of satisfaction and positive attitudes, followed by infliximab, etanercept and ustekinumab while other subcutaneous anti TNF agents (adalimumab and certolizumab pegol) did not demonstrate significant results. As for perceived improvement from baseline, expressed by Δ -Self reported assessment, better results were reached by patients undergoing ixekizumab, secukinumab and ustekinumab with ixekizumab showing largest median difference, followed by adalimumab, certolizumab and etanercept.

Many studies have been published about efficacy and safety of systemic agents for psoriasis, but information regarding treatment preferences, patients' satisfaction and attitudes are scarce. Objective physician evaluation performed through validated severity scales may be discordant from patient-reported outcomes in psoriasis treatment, since these latter may be influenced by other factors referring to satisfaction and patient attitudes.¹⁹

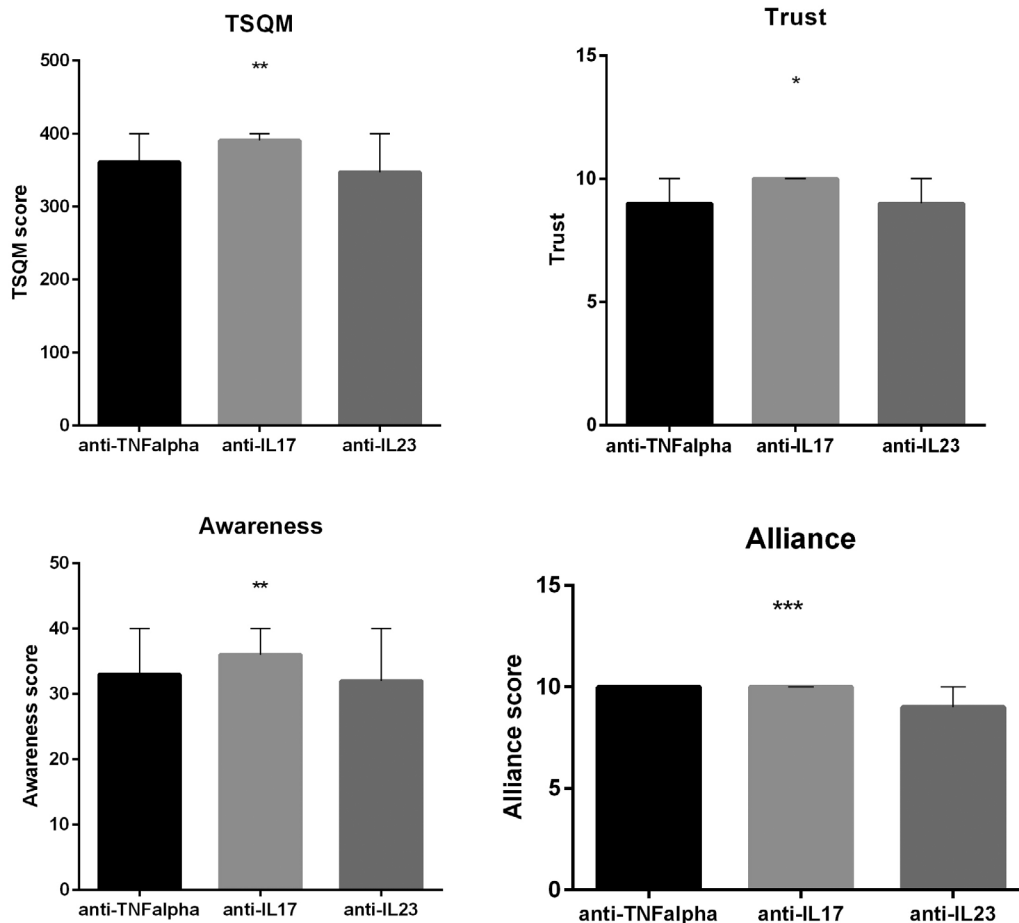


FIGURE 1 Comparison among biologic agents in term of satisfaction and attitudes (trust, awareness, and alliance)

TABLE 4 Analysis of single agent median values of TSQM, attitudes and self-reported treatment outcomes (Δ -Self reported assessment). Bold number indicate statistically significant results p value <0.05

	Number of patients (%)	TSQM	Trust	Awareness	Alliance	Δ -Self reported assessment	P	
Adalimumab	128 (14.2)	No	3417	9.0	33.0	9.0	6.0	P = .028
		Yes	350.0	9.0	34.0	9.0	7.0	
Certolizumab	25 (2.8)	No	341.7	9.0	33.0	9.0	6.0	P = .339
		Yes	336.1	8.0	32.0	10.0	6.0	
Etanercept	152 (16.9)	No	333.3	8.0	33.0	9.0	6.0	P = .009
		Yes	365.3	9.0	33.0	10.0	5.0	
Ixekizumab	63 (7.0)	No	340.3	9.0	33.0	9.0	6.0	P < .001
		Yes	400.0	10.0	36.0	10.0	8.0	
Infliximab	43 (4.8)	No	341.7	9.0	33.0	9.0	6.0	P = .007
		Yes	366.7	10.0	34.0	10.0	7.0	
Secukinumab	113 (12.6)	No	336.1	8.0	33.0	9.0	6.0	P < .001
		Yes	383.3	9.0	36.0	10.0	7.0	
Ustekinumab	75 (8.3)	No	341.7	8.0	33.0	10.0	6.0	P < .001
		Yes	347.2	9.0	32.0	9.0	7.0	

Abbreviation: TSQM, Treatment Satisfaction Questionnaire for Medication.

Patient satisfaction is a very important issue and has been often highly correlated with treatment adherence, drug survival, and treatment success.^{3,10-12} From a patient perspective, treatment efficacy and safety were reported to be the most important factors influencing treatment satisfaction, followed by doctor-patient communication and therapeutic alliance.²⁰

Studies showing suboptimal adherence rates in patients with psoriasis highlighted the need to improve patient compliance and treatment satisfaction,²⁰ taking into account patients' preference in the treatment decision-making process.²¹

The findings of our study demonstrated a high-treatment satisfaction and a positive attitude, in particular for trust and alliance domains followed by awareness, with a higher score for patients undergoing biologic treatments compared to non-biologic treatments. Among biologics, higher values were reported by patients treated with the newer anti-IL17 agents compared to anti-TNF alpha and anti-IL12/23 agents. Males demonstrated higher satisfaction, trust, and awareness whereas alliance did not show association with sex. Age showed inverse association with satisfaction and alliance and was not associated with trust and awareness. A higher educational level was associated with higher satisfaction and attitudes scores, except for alliance. Ongoing biologic treatment and i.v. administration was associated with higher satisfaction and positive attitude scores, while an inverse association with administration frequency was observed. Treatment duration and self-assessed efficacy demonstrated an association with all satisfaction and attitudes scores as well as drug-related adverse events occurrence.

Our results are in line with previous studies consistently showing that patients treated with biologic agents demonstrate higher treatment satisfaction.⁸ However, patients' satisfaction toward all treatment modalities, including topical agents and phototherapy, remains modest. A possible explanation is that many patients might have not received treatment options commensurate with the severity/extent of their disease as recommended, leading to frustration and perceived insufficient efficacy, increasing need for information and search for available treatment options.⁴

Dermatologists need to communicate to psoriasis patients the feeling of "understanding the disease," hope about its curability and disease control. These elements should be taken into account whenever educational interventions are planned.²²

A recent review exploring treatment preference and satisfaction described a large heterogeneity and variability over time among psoriasis patients. The most important treatment attributes were the place (hospital/home) where the treatment was administered, probability of benefit, route of administration, and risk of adverse events.³ Our results demonstrated a large impact on each satisfaction and attitudes domain of treatment-related characteristics including biologic agents, lower frequency of administration, longer treatment duration, i.v. administration, showing patient preference for inpatient or daily hospital management. A Canadian survey on 343 patients showed a greater treatment satisfaction among biologic users compared with non-biologic users. They also demonstrated that patients had poor

information about treatment modalities and physicians may consider counseling these patients psoriasis management.⁹

Treatment satisfaction and positive attitudes including trust, awareness, and alliance are very important issues in psoriasis management. Understanding the disease and treatment experience of patients and their opinions using validated satisfaction tools and psychometric attitudes scales is crucial to improve doctor-patient relationship and the active role of patients in treatment decision making. Physician-patient relationship relies heavily on the patients' satisfaction with therapy and efforts have been made to find ideal instruments to be routinely used in clinical practice.¹³ In 2017 the International Dermatology Outcome Measures (IDEOM) annual meeting established the limitation of current validated instruments and the need to develop, validate, and standardize a dermatology-specific treatment satisfaction measure.¹³

Limitations of this study include the exclusively subjective patient evaluation of treatment outcome and improvement from baseline due to the cross-sectional study nature, lacking an objective clinical disease measure and the use a non-validated attitude scale arising from a consensus panel of experts. However, positive characteristics of this study were the large sample size, multicenter nature, the completely patient-centered consistency of assessment and the use of the TSQM validated scale complemented by a psychometric attitude scale, which, although non-validated, helped communication and measurement of patients' feelings and opinion.

In conclusion, our findings describe the characteristics of patients' satisfaction and attitudes, exploring a difficult area of psoriasis management. Newer and valid tools facilitating communication and exploring important aspects of patients' view on treatments, their experience and relationship with clinicians are needed.

CONFLICT OF INTEREST

Maria Esposito has served as speaker and/or consultant for Abbvie, Almirall, Biogen, Celgene, Eli Lilly, Janssen, Leo Pharma, Novartis, Sanofi Genzyme, UCB. Alessandro Giunta has served as speaker and/or consultant for Abbvie, Biogen, Eli Lilly, Pfizer, UCB. Paolo Gisondi has been a consultant and/or speaker for Abbvie, Almirall, Celgene, Janssen, Leo-pharma, Eli Lilly, Merck Sharp & Dohme, Novartis, Pfizer, Sandoz, UCB. Maria Concetta Fagnoli has served on advisory boards, received honoraria for lectures and research grants from Almirall, Abbvie, Galderma, Leo Pharma, Mylan, Medac Pharma, Celgene, Pierre Fabre, UCB, Eli Lilly, Pfizer, Janssen, Novartis, Sanofi-Genzyme, Roche, Sunpharma, and MSD. Luca Bianchi has served as consultant and speaker for Abbvie, Janssen, Pfizer and Novartis. Ketty Peris reports grants and personal fees from Almirall and AbbVie, and personal fees from Biogen, Lilly, Celgene, Galderma, Leo Pharma, Novartis, Pierre Fabre, Sanofi, Sandoz, Sun Pharma and Janssen, outside the submitted work. Giampiero Girolomoni has been principal investigator in clinical trials sponsored by and/or and has received personal fees from AbbVie, Abiogen, Almirall, Alphasights, Amgen, Biogen, Bristol-Meyers Squibb, Celgene, Celltrion, Eli-Lilly, Genzyme, Gerson Lehrman Group, Guidepoint Global, Leo Pharma, Menlo

therapeutics, Novartis, OM Pharma, Pfizer, Regeneron, Samsung, Sandoz and UCB.

AUTHOR CONTRIBUTION

Study concept and design: Maria Esposito. Alessandro Giunta, Luca Bianchi, Ketty Peris, Giampiero Girolomoni. Acquisition, analysis, and interpretation of data: all authors. Drafting of manuscript: Maria Esposito, Alessandro Giunta, Maria Concetta Fagnoli, Luca Bianchi, Ketty Peris, Giampiero Girolomoni. Critical revision of the manuscript for important intellectual content: all authors. Statistical analysis: Cristina Pellegrini. Obtained funding: Giampiero Girolomoni. Administrative, technical or material support: not applicable. Study supervision: Maria Esposito.

DATA AVAILABILITY STATEMENT

Data available on request from the authors

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