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Cumulative clinical benefits of biologic treatments in patients with moderate-to-severe psoriasis: an Italian real-life experience – IL PSO (Italian Landscape Psoriasis)

Diego Orsini,[1] Luca Potestio,[2] Maria Concetta Fargnoli,[3] Alessandra Narcisi,[4,5] Luciano Ibba,[4,5] Chiara Assorgi,[6] Anna Balato,[7] Martina Burlando,[8] Anna Campanati,[9] Carlo Giovanni Carrera,[10,11] Andrea Carugno,[12] Antonio Costanzo,[4,5] Emanuele Cozzani,[8] Paolo Dapavo,[13] Annunziata Dattola,[6] Eugenia Veronica Di Brizzi,[7] Antonio Di Tano,[14] Valentina Dini,[15,16] Francesca Maria Gaiani,[17] Luigi Gargiulo,[4,5] Giampiero Girolomoni,[18] Claudio Guarneri,[19] Claudia Lasagni,[20] Francesco Loconsole,[21] Piergiorgio Malagoli,[17] Angelo Valerio Marzano,[10,11] Luca Mastorino,[13] Martina Maurelli,[18] Francesco Messina,[17] Alessandra Michelucci,[15,16] Giovanni Pellacani,[6] Simone Ribero,[12] Massimo Travaglini,[22] Emanuele Trovato,[23] Nicola Zerbinati[12] and Matteo Megna[2]

[1]Clinical Dermatology Unit, San Gallicano Dermatological Institute, IRCCS, Rome, Italy
[2]Section of Dermatology, Department of Clinical Medicine and Surgery, University of Naples Federico II, Naples, Italy
Correspondence: Diego Orsini. Email: diego.orsini@ifo.it
A full list of affiliations is provided in Appendix 1.
D.O. and L.P. contributed equally to this work.

Abstract

Background Psoriasis is a chronic inflammatory disease associated with significant long-term cumulative life course impairment. Achieving rapid relief from psoriasis is a crucial aspect of an effective treatment, as it helps patients manage their daily discomfort, including pain, itching, embarrassment and other negative impacts of the disease. Cumulative clinical benefit, measured as the area under the curve (AUC) of Psoriasis Area and Severity Index (PASI) responses and days free of disease, offers a comprehensive assessment of treatment efficacy over time.

Objectives To evaluate the cumulative clinical benefits of biologic therapies in patients with moderate-to-severe plaque psoriasis in a real-world Italian multicentre setting.

Methods This multicentre retrospective real-life study included patients treated with bimekizumab, brodalumab, guselkumab, ixekizumab, risankizumab, secukinumab, tildrakizumab or ustekinumab at 23 Italian referral centres. Cumulative benefit was assessed by the AUC of PASI 100 (100% improvement from baseline) from week 0 to week 52, and days free of disease (PASI 100). Analyses included subgroup evaluations by biologic-naive status and baseline PASI (≤ 10 vs. >10).

Results Among 1017 patients, bimekizumab showed the highest cumulative clinical benefit, with a mean of 203 days free of disease. It was significantly superior to guselkumab ($P<0.05$), secukinumab ($P<0.01$), ustekinumab ($P<0.01$) and tildrakizumab ($P<0.001$). The advantage was consistent across subgroups, with 216 days free of disease in biologic-naive and 184 in biologic-experienced patients. No significant differences were found between bimekizumab and ixekizumab, brodalumab or risankizumab.

Conclusions In this multicentre real-life study, bimekizumab showed exploratory evidence of the cumulative clinical benefit of biologics in moderate-to-severe psoriasis. These findings highlight the importance of cumulative endpoints and individualized treatment strategies in daily practice.

What is already known about this topic?

- Achieving rapid relief from psoriasis is a crucial aspect of an effective treatment, as it helps patients manage their daily discomfort, including pain, itching, embarrassment and other negative impacts of the disease.
- Cumulative clinical benefit, measured as the area under the curve of Psoriasis Area and Severity Index responses and days free of disease, offers a comprehensive assessment of treatment efficacy over time.

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What does his study add?

- Bimekizumab shows exploratory evidence of the cumulative clinical benefit of biologics in moderate-to-severe psoriasis.
- Our findings highlight the importance of cumulative endpoints and individualized treatment strategies in daily practice.

Patients with psoriasis often experience diminished quality of life and substantial long-term cumulative life course impairment.[1] Psoriasis is a systemic inflammatory disease that significantly affects physical, psychological and social wellbeing.[1] The burden of disease often includes fatigue, stigmatization, anxiety and depression, highlighting its profound impact on multiple aspects of daily life.[1] Therefore, achieving rapid relief from psoriasis is a crucial aspect of an effective treatment, as it helps patients manage their daily discomfort, including pain, itching, embarrassment and other negative impacts of the disease.

A newer method for evaluating the cumulative clinical benefit of psoriasis treatments is the area under the curve (AUC).[2] Cumulative clinical benefit is defined as the total therapeutic effect of a treatment over a given time period, accounting for both the extent and duration of clinical response. This measure, calculated through the AUC of Psoriasis Area and Severity Index (PASI) responses, makes it possible to highlight differences in cumulative efficacy among people responding to treatment.[3]

The cumulative clinical benefit can be affected by variations in response, as well as the speed and durability of the response over time.[3] While cumulative life course impairment refers to the long-term burden of the disease, assessing the cumulative clinical benefit provides insight into the overall therapeutic impact of treatment on patients.

A recent meta-analysis demonstrated that among biologics approved for psoriasis treatment, anti-interleukin (IL)-17 drugs consistently showed greater cumulative clinical benefits on PASI 75, PASI 90 and PASI 100 (≥ 75%, ≥90% and 100% improvement from baseline) over a 12- or 16-week period compared with anti-IL-23 and other biologics.[4] Considering 1 year of exposure, another meta-analysis showed that IL-17 and IL-23 inhibitors demonstrated greater cumulative clinical benefits for both PASI 100 and PASI 90 compared with IL-12/23 and tumour necrosis factor inhibitors, in particular for complete and almost-complete skin clearance. Among them, ixekizumab and risankizumab provided the greatest cumulative clinical benefits over 1 year.[5] Moreover, an international multicentre observational study investigating PASI 100 durability found that, after 12 months of treatment, the cohort receiving anti-IL-17A therapy had higher response rates (18.2% vs. 11.5%) and significantly higher odds (odds ratio 1.8) than the cohort receiving other biologics.[6]

In this context, the novel IL-17A/F inhibitor bimekizumab demonstrated superior outcomes over a 48-week period compared with an anti-IL-17A agent such as secukinumab. Specifically, the total AUC and the estimated number of days during which patients achieved PASI 100 were significantly higher in patients randomized to bimekizumab than in those receiving secukinumab.[7] This suggests that bimekizumab may offer a robust and long-lasting therapeutic benefit for patients with moderate-to-severe plaque psoriasis.

Our retrospective study aimed to evaluate the cumulative clinical benefits of biologic treatments for psoriasis in a real-world setting. This approach is essential to guide clinicians in the treatment selection process.[8] Cumulative benefit reflects not only the extent of clinical response but also the speed of onset and its durability over time, factors that are critical in optimizing patient care and achieving the right treatment for the right patient at the right time.[8]

In addition to the AUC, we also assessed the number of days free of disease, defined as the total number of days in which a patient maintained complete skin clearance (PASI 100).[8] This metric provides a direct and intuitive measure of sustained treatment efficacy, capturing both the persistence of response and its impact on quality of life.[8]

Patients and methods

This multicentre, retrospective study included patients affected by moderate-to-severe plaque psoriasis treated with bimekizumab, brodalumab, guselkumab, ixekizumab, risankizumab, secukinumab, tildrakizumab and ustekinumab from 1 December to 31 December 2023, at 23 Italian referral hospitals participating in the Italian Landscape Psoriasis (IL PSO) project. IL PSO is a national multicentre observational initiative aimed at describing treatment patterns and the effectiveness and outcomes of systemic therapies for moderate-to-severe psoriasis in daily clinical practice.

The IL PSO project does not follow a single interventional protocol, as it is based on retrospective chart reviews reflecting routine clinical management. However, data collection is standardized through a predefined common case report form shared across centres. Patients affected by moderate-to-severe plaque psoriasis and eligible for systemic treatments were included. Ethical approval was not required, as the study involved retrospective data collection without deviation from routine clinical care. All participants had provided written informed consent for the use of their anonymized clinical data during standard clinical visits. The study complied with the Declaration of Helsinki.

Outcome measures

The cumulative clinical benefits of each biologic treatment from week 0 to week 52 were estimated using the AUC method. The AUC represents the total exposure to a drug or the overall effect of a treatment by integrating the response over a specified period. Due to the observational nature of this study, the AUCs were calculated for PASI 100 response rates at week 0, week 16 (± 4 weeks), week 28 (± 4 weeks) and week 52 (± 4 weeks) across all biologics studied. At baseline, demographic data, disease characteristics (PASI and body surface area), psoriasis duration, previous treatments, comorbidities (including psoriatic arthritis) and treatment were registered. At each follow-up, disease severity evaluations were performed with PASI and involved body surface area.

Table 1 Demographic and clinical characteristics

Variable	Bimekizumab	Brodalumab	Guselkumab	Ixekizumab	Risankizumab	Secukinumab	Tildrakizumab 100 mg	Ustekinumab
No. of patients	130	128	125	126	124	125	129	130
Age at first dose (years), mean (SD)	49.8 (14.5)	55.4 (17.6)	52.3 (19.5)	51.6 (20.2)	53.1 (20.4)	49.1 (15.0)	56.9 (20.3)	48.3 (15.7)
Female, *n* (%)	39 (30.0)	29 (22.7)	39 (31.2)	40 (31.7)	40 (32.3)	49 (39.2)	40 (31.0)	41 (31.5)
Weight (kg), mean (SD)	82.6 (19.2)	80.7 (17.0)	79.9 (18.6)	77.2 (14.6)	80.1 (19.3)	77.6 (13.9)	80.2 (15.7)	80.7 (17.3)
BMI (kg m^{-2}), mean (SD)	27.5 (5.5)	27.2 (5.0)	26.8 (5.4)	25.8 (4.7)	26.8 (6.3)	26.6 (4.2)	26.5 (4.2)	27.5 (5.0)
Age at psoriasis diagnosis (years), mean (SD)	38.0 (16.4)	40.3 (20.3)	37.8 (20.0)	36.6 (19.8)	39.4 (21.6)	36.8 (15.1)	41.5 (24.0)	34.6 (17.7)
Biologic naive, *n* (%)	76 (58.5)	92 (71.9)	60 (48.0)	73 (57.9)	89 (71.8)	92 (73.6)	104 (80.6)	79 (60.8)
PASI score at baseline, mean (SD)	16.3 (8.0)	15.6 (6.3)	12.4 (5.9)	15.8 (6.3)	14.8 (6.1)	14.7 (5.5)	12.6 (6.3)	13.7 (7.1)
PASI > 10, *n* (%)	96 (73.8)	95 (74.2)	75 (60.0)	104 (82.5)	90 (72.6)	99 (79.2)	73 (56.6)	84 (64.6)

BMI, body mass index; PASI, Psoriasis Area and Severity Index.

The total AUC for each PASI response was determined using the trapezoidal rule.[2] The number of days free of disease (i.e. PASI 100) was also calculated for each treatment, considering 1 year of treatment exposure.

The nominal AUC and the number of days free of disease were also evaluated according to previous exposure to other biologics (i.e. biologic naive vs. previously exposed) and by severity at baseline, defined as PASI ≤ 10 vs. PASI > 10.

Differences between treatments in the number of days free of disease were determined by means of the Dwass–Steel–Critchlow–Fligner method for multiple comparisons. Categorical data were recorded as absolute frequencies and percentages, while continuous data were recorded as the mean and SD. For PASI 100 calculation, where data were missing, patients were considered nonresponders. No other imputation was done in the case of missing data. All analyses were performed using SAS v9.4 (SAS Institute Inc., Cary, NC, USA).

Sample size

A sample of 120 patients per group would provide 80% power to detect a statistically significant difference of 45 days in PASI 100, with an SD of 120 days, using a non-parametric Wilcoxon (Mann–Whitney) rank-sum test, with a two-sided significance level of 0.05.

Results

A complete description of the baseline characteristics of the 1017 patients is provided in Table 1, stratified by biologic treatment.

Figure 1 shows the percentages of patients reaching PASI 100 at week 16, week 28 and week 52 by biologic treatment. After 52 weeks of treatment, > 50% of patients achieved PASI 100. Specifically, response rates were 75% for bimekizumab, 64% for risankizumab, 63% for ixekizumab, 61% for brodalumab, 60% for tildrakizumab, 58% for guselkumab, 56% for ustekinumab and 50% for secukinumab.

The cumulative benefit of treatment, in terms of total time spent in PASI 100 (days free of disease) over 1 year, was consistent with the PASI 100 response rate (Table 2). Specifically, Figure 2 illustrates that bimekizumab ranked first, with an average of 203 days free of disease, followed

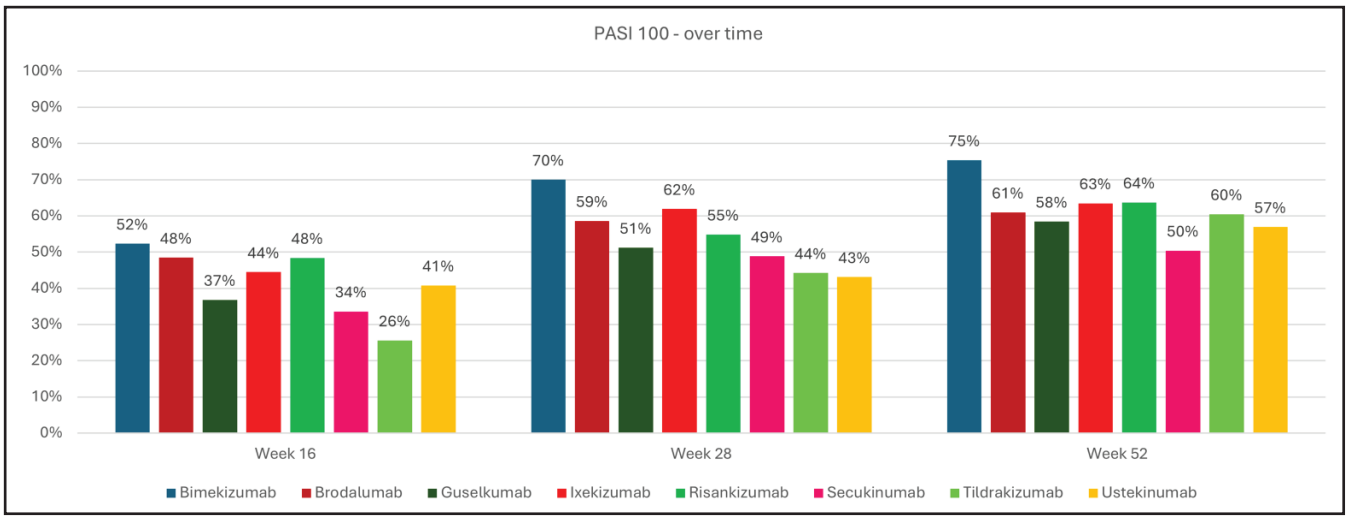

Figure 1 PASI 100 (100% improvement in Psoriasis Area and Severity Index from baseline) over time by biologic treatment.

Table 2 Cumulative benefit and days free of disease by biologic treatment

Current biologic	Rank	AUC	Days spent in PASI 100	Difference vs. bimekizumab (days)
Bimekizumab	1	2897	203	–
Brodalumab	3	2464	172	−30
Guselkumab	5	2138	150	−53
Ixekizumab	2	2498	175	−28
Risankizumab	4	2429	170	−33
Secukinumab	7	1954	137	−66
Tildrakizumab 100 mg	8	1879	132	−71
Ustekinumab	6	2029	142	−61

AUC, area under the curve; PASI 100, 100% improvement in Psoriasis Area and Severity Index from baseline.

by ixekizumab (175 days), brodalumab (172 days) and risankizumab (170 days). In contrast, guselkumab, ustekinumab, secukinumab and tildrakizumab showed lower mean values: 150, 142, 137 and 132 days, respectively. Bimekizumab provided a statistically significant higher mean number of days free of disease compared with guselkumab ($P<0.05$), secukinumab ($P<0.01$), ustekinumab ($P<0.01$) and tildrakizumab ($P<0.001$) (Table S1; see Supporting Information).

A subgroup analysis by bio-naive status is shown in Table 3 and Figure 3. Bimekizumab consistently ranked first in both cohorts: 216 days in bio-naive patients and 184 days in bio-experienced patients. Among bio-naive patients, bimekizumab was significantly superior to secukinumab ($P<0.05$), tildrakizumab ($P<0.001$) and ustekinumab ($P<0.001$) (Table S2; see Supporting Information).

As regards bio-experienced patients, no statistically significant differences were found comparing bimekizumab to other biologics (Table S2).

Brodalumab, guselkumab and tildrakizumab also maintained consistent ranks in both groups (3, 5 and 7, respectively). In contrast, ixekizumab ($P<0.001$) and ustekinumab ($P<0.05$) tended to perform better in bio-experienced than bio-naive patients (ranked 2 vs. 4 and 4 vs. 8, respectively), while risankizumab ($P<0.001$) and secukinumab ($P<0.001$) showed better outcomes in bio-naive than bio-experienced patients (ranked 2 vs. 6 and 6 vs. 8, respectively) (Table 3).

Subgroup analysis based on baseline PASI score (≤ 10 vs. >10) is presented in Table 4 and Figure 4. Bimekizumab remained the top-ranking treatment in both cohorts (200 days with PASI ≤ 10 and 204 days with PASI >10).

Ixekizumab, guselkumab and tildrakizumab tended to show better responses in patients with a baseline PASI score ≤ 10, whereas brodalumab, risankizumab and secukinumab had better outcomes in patients with a baseline PASI score >10. However, bimekizumab showed statistically significant differences only compared with guselkumab ($P<0.05$), secukinumab ($P<0.05$), tildrakizumab ($P<0.001$) and ustekinumab ($P<0.05$) and only in the PASI >10 group (Table S3; see Supporting Information).

Considering the anti-IL-17A, anti-IL-17A/F, anti-IL-23, anti-IL-17A receptor and anti-IL-12/23 classes, the anti-IL-17A/F agent (bimekizumab) showed statistically superior efficacy in terms of cumulative benefit of treatment compared with anti-IL-23 class (203 vs. 150 days, $P<0.001$), anti-IL-12/23 (203 vs. 142 days, $P=0.001$) and anti-IL-17/A (203 vs. 156 days, $P=0.01$). No statistically significant differences were observed among the other classes (Table S4; see Supporting Information).

Discussion

This large, multicentre, real-life study investigated the cumulative clinical benefit of biologic therapies in patients with moderate-to-severe psoriasis, assessed through the AUC and days spent in PASI 100 over 52 weeks. Among the biologics analysed, bimekizumab showed the highest cumulative benefit, both overall and across key subgroups, including bio-naive patients and those with higher disease severity.

Specifically, bimekizumab achieved the highest cumulative clinical benefit overall (203 days free of disease), with statistically significant superiority over guselkumab,

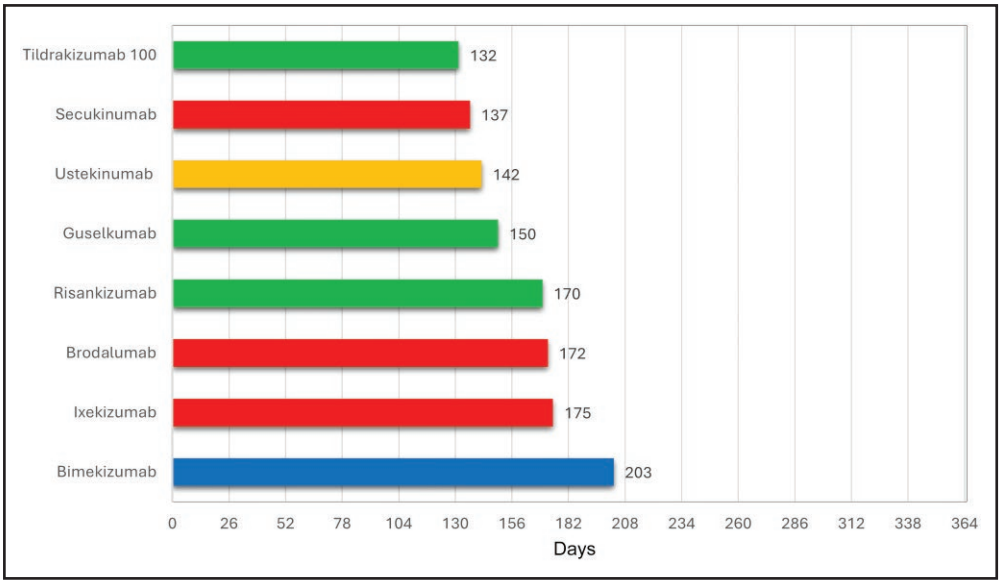

Figure 2 Number of days free of disease over 1 year of biologic treatment.

Table 3 Cumulative benefit and days free of disease by biologic treatment and bio-naive status

Current biologic	Bio-naive status	No. of patients	Rank	AUC	Days spent in PASI 100
Bimekizumab	No	54	1	2622	184
	Yes	76	1	3092	216
Brodalumab	No	36	3	2322	163
	Yes	92	3	2520	176
Guselkumab	No	65	5	2080	146
	Yes	60	5	2200	154
Ixekizumab	No	53	2	2608	183
	Yes	73	4	2419	169
Risankizumab	No	35	6	1983	139
	Yes	89	2	2604	182
Secukinumab	No	33	8	1564	109
	Yes	92	6	2093	147
Tildrakizumab	No	25	7	1680	118
100 mg	Yes	104	7	1927	135
Ustekinumab	No	51	4	2212	155
	Yes	79	8	1911	134

AUC, area under the curve; PASI 100, 100% improvement in Psoriasis Area and Severity Index from baseline.

secukinumab, ustekinumab and tildrakizumab. This advantage was consistently maintained across key subgroups, including both bio-naive (216 days) and bio-experienced patients, as well as across different baseline PASI scores. Of note, there were no notable differences between patients with moderate psoriasis (PASI < 10) and severe psoriasis (PASI > 10) (204 vs. 200 days), suggesting that bimekizumab is equally effective regardless of disease severity.

This finding may be related to the fact that bimekizumab is the only approved biologic to simultaneously neutralize both IL-17A and IL-17F, two cytokines that play complementary roles in psoriatic inflammation. This dual blockade may explain the superior depth and durability of response seen with bimekizumab. However, it is important to note that although bimekizumab demonstrated numerically the greatest benefit, it did not achieve statistically significant superiority over all agents, and real-world treatment decisions should consider individual patient profiles, comorbidities and prior biologic exposure.

Indeed, we observed a difference of approximately 1 month less in days free of disease for ixekizumab, brodalumab and risankizumab compared with bimekizumab. Ixekizumab and brodalumab also performed well in terms of cumulative benefit. This is likely explained by their rapid onset of action and high skin clearance rates, as demonstrated in randomized clinical trials.

Ixekizumab showed a slight tendency to be more effective in patients with moderate disease (baseline PASI ≤ 10), achieving 199 days free of disease (rank 2) vs. 170 days in patients with severe psoriasis ($P < 0.001$), and also in bio-experienced patients compared with bio-naive patients (183 vs. 169 days, $P < 0.001$). Brodalumab tended to be more effective in bio-naive patients (176 vs. 163 days, rank 3, $P < 0.001$) and in patients with severe disease (178 vs. 157 days, $P < 0.001$). Risankizumab showed its best results in bio-naive patients (182 vs. 139 days, rank 2, $P < 0.001$) and in patients with severe psoriasis (177 vs. 152 days, rank 3), suggesting that bio-naive patients and those with severe psoriasis could benefit the most from this treatment.

Other biologics, including guselkumab, secukinumab, ustekinumab and tildrakizumab, showed consistently lower cumulative benefits, with reductions ranging from 53 to 71 fewer days compared with bimekizumab. Notably, guselkumab appeared more effective in patients with moderate psoriasis (165 days) but less so in those with severe disease

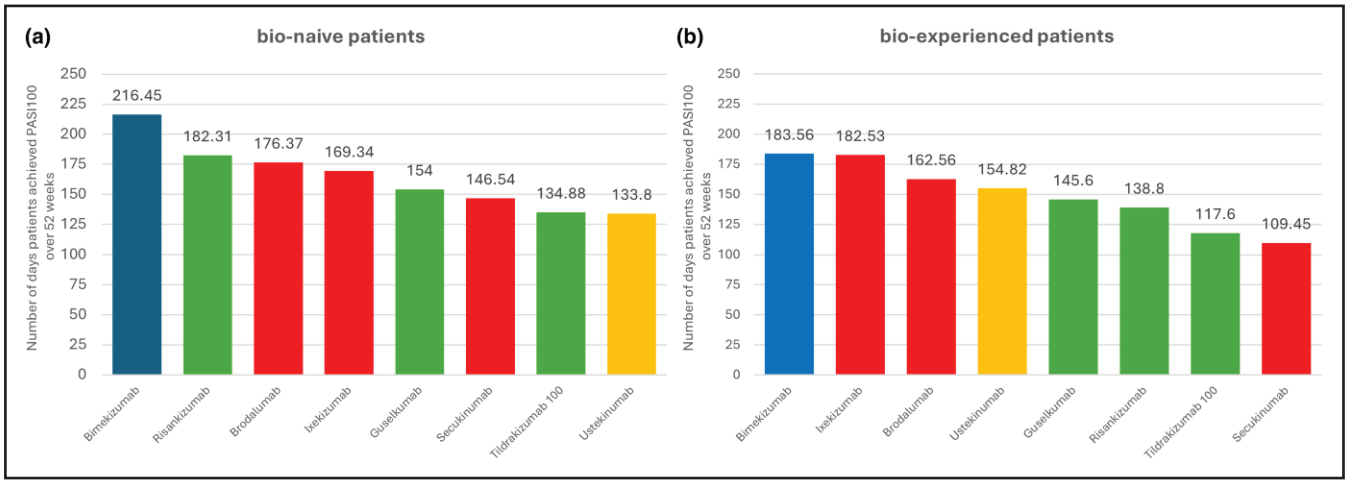

Figure 3 Number of days free of disease over 1 year of biologic treatment and bio-naive status. PASI 100, 100% improvement in Psoriasis Area and Severity Index from baseline.

Table 4 Cumulative benefit and days free of disease by biologic treatment and Psoriasis Area and Severity Index (PASI) score at baseline

Current biologic	PASI class at baseline	No. of patients	Rank	AUC	Days spent in PASI 100
Bimekizumab	PASI > 10	96	1	2913	204
	PASI ≤ 10	34	1	2853	200
Brodalumab	PASI > 10	95	2	2539	178
	PASI ≤ 10	33	4	2248	157
Guselkumab	PASI > 10	75	7	1987	139
	PASI ≤ 10	50	3	2364	165
Ixekizumab	PASI > 10	104	4	2427	170
	PASI ≤ 10	22	2	2836	199
Risankizumab	PASI > 10	90	3	2529	177
	PASI ≤ 10	34	5	2165	152
Secukinumab	PASI > 10	99	5	2067	145
	PASI ≤ 10	26	8	1523	107
Tildrakizumab	PASI > 10	73	8	1808	127
100 mg	PASI ≤ 10	56	7	1971	138
Ustekinumab	PASI > 10	84	6	2005	140
	PASI ≤ 10	46	6	2074	145

AUC, area under the curve; PASI 100, 100% improvement in PASI from baseline.

(139 days). Secukinumab was more effective in bio-naive patients (147 days) but was the least effective treatment for moderate disease (107 days). Ustekinumab showed better results in bio-experienced patients (155 days), whereas tildrakizumab performed slightly better in moderate cases (138 days) but had the lowest efficacy in bio-experienced patients (118 days).

No statistically significant differences in terms of AUC and days free of disease were found when comparing bimekizumab with risankizumab, ixekizumab and brodalumab.

Globally, these variations in subgroup performance across biologics highlight the complexity of treatment selection in real life and emphasize the importance of individualized treatment decisions based on patient history, disease severity and prior treatment exposure. Our findings highlight the heterogeneity in performance of biologics and support the need for individualized treatment strategies based on prior exposure, disease severity and therapeutic goals. The use of cumulative metrics, such as AUC and days in PASI 100, adds meaningful clinical insight beyond traditional static endpoints, particularly in evaluating real-world impact.

Achieving and maintaining complete skin clearance (PASI 100) over time are increasingly recognized as pivotal treatment goals in moderate-to-severe psoriasis. These outcomes not only reflect optimal disease control but also translate into tangible improvements in patients' quality of life and reduced cumulative life course impairment. Therefore, treatments that induce a fast and durable PASI 100 response may have the greatest potential to prevent the downstream impact of uncontrolled disease.

The strengths of this study include its large, multicentre design involving 23 referral centres across Italy; the inclusion of over 1000 patients; the comprehensive analysis of multiple biologic classes (anti-IL-17A, anti-IL-17A/F, anti-IL-23, anti-IL-17 receptor and anti-IL-12/23); and the combined evaluation of both absolute (days in PASI 100) and cumulative (AUC) treatment outcomes. In addition, the study offers meaningful subgroup analyses by bio-naive status and baseline PASI score, applying nonparametric statistics suitable for real-world, non-normally distributed data. These features enhance the generalizability and clinical relevance of the findings.

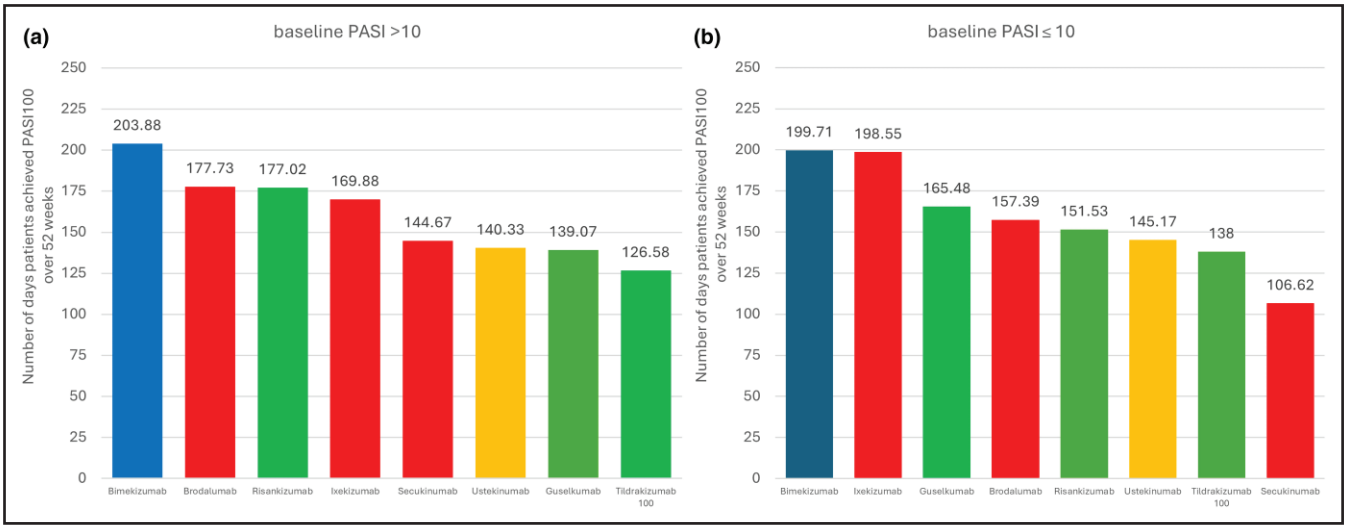

Figure 4 Number of days free of disease over 1 year of biologic treatment by Psoriasis Area and Severity Index (PASI) score at baseline.

However, several limitations should be acknowledged. The retrospective and observational nature of the study may introduce selection bias, as treatment decisions were not randomized but clinician driven. Similarly, the variation in timing of PASI assessments across centres may have influenced AUC estimates. Specifically, earlier or later assessments around weeks 16 and 28 could lead to under- or overestimation of cumulative benefit depending on the treatment's speed of response. Potential confounders such as obesity, smoking, treatment adherence and concomitant therapies were not adjusted for. Moreover, variability in clinical assessment practices across centres, and absence of formal imputation for missing data (except for nonresponder imputation in PASI 100) may limit the interpretability of quality-of-life outcomes. Finally, the 52-week follow-up period does not provide insight into long-term treatment sustainability. Consequently, these findings should be interpreted with caution and considered as hypothesis generating, pending confirmation in prospective, controlled studies.

In conclusion, this multicentre, real-life study provides exploratory evidence on the cumulative clinical benefit of biologics in moderate-to-severe psoriasis. Bimekizumab consistently showed the highest number of days in PASI 100 at 1 year, with statistically significant superiority over guselkumab, secukinumab, ustekinumab and tildrakizumab. Although differences with other agents such as ixekizumab, brodalumab and risankizumab did not reach statistical significance, trends suggest potential subgroup-specific advantages.

Given the study's observational design, these findings should be interpreted as hypothesis generating. However, they support bimekizumab as a promising option for achieving rapid and durable disease control, while highlighting the importance of individualized treatment strategies in clinical practice. Certainly, cumulative benefit metrics such as AUC and days in PASI 100 may help guide treatment decisions to offer patients a tailored and personalized approach.

Author contributions

Diego Orsini (Conceptualization, DataCuration, FormalAnalysis, Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Luca Potestio (Conceptualization, DataCuration, Investigation, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Maria Concetta Fargnoli (Conceptualization, DataCuration, Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Alessandra Narcisi (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Luciano Ibba (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Chiara Assorgi (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Anna Balato (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Martina Burlando (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Anna Campanati (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Carlo G. Carrera (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Andrea Carugno (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Antonio Costanzo (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Emanuele Cozzani (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Paolo Dapavo (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Annunziata Dattola (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Eugenia Veronica Di Brizzi (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Antonio di Tano (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Valentina Dini (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Francesca Maria Gaiani (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Luigi Gargiulo (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Giampiero Girolomoni (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Claudio Guarneri (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Claudia Lasagni (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Francesco Loconsole (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Piergiorgio Malagoli (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Angelo Valerio Marzano (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Luca Mastorino (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Martina Maurelli (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Francesco Messina (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Alessandra Michelucci (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Giovanni Pellacani (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Simone Ribero (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Massimo Travaglini (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Emanuele Trovato (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]), Nicola Zerbinati (Conceptualization, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]) and Matteo Megna (Conceptualization, DataCuration, Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing [Equal]).

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Conflicts of interest

D.O. has been a speaker and/or consultant for AbbVie, LEO Pharma, UCB, Bristol Myers Squibb and Boehringer Ingelheim. M.C.F. has served on advisory boards for and received honoraria for lectures and/or research grants from Amgen, Almirall, AbbVie, Boehringer Ingelheim, BMS, Galderma, Kyowa Kyrin, Incyte, LEO Pharma, Pierre Fabre, UCB, Lilly, Pfizer, Janssen, MSD, Novartis, Sanofi, Regeneron and Sun Pharma. A.N. has served on advisory boards for and received honoraria for lectures and research grants from Almirall, AbbVie, Bristol Myers Squibb, LEO Pharma, Celgene, Eli Lilly, Janssen, Novartis, Sanofi Genzyme, Amgen and Boehringer Ingelheim. L.I. has been a consultant for Almirall. A.B. has received honoraria for participation in advisory boards and meetings, or as speaker for AbbVie, Celgene, Janssen-Cilag, Eli Lilly, Novartis Pharma, Pfizer, Sanofi Genzyme and UCB Pharma. M.B. has acted as a speaker and consultant for AbbVie, Janssen, Amgen, Novartis, Eli Lilly and UCB Pharma. A. Campanati has served as a speaker, consultant or advisory board member for AbbVie, Almirall, Amgen, Eli Lilly, LEO Pharma, Janssen-Cilag, Novartis, Pfizer, Sanofi-Aventis, Boehringer Ingelheim and UCB Pharma. C.G.C. has served as a board participant or speaker for AbbVie, Lilly, Janssen, Novartis, Celgene, Almirall and LEO Pharma. A. Carugno has been a speaker and/or consultant for Almirall, Amgen, AbbVie, Boehringer Ingelheim, Eli Lilly, LEO Pharma, Janssen-Cilag, Novartis and UCB Pharma. A. Costanzo has been a consultant and/or speaker for AbbVie, Almirall, Amgen, Janssen, LEO Pharma, Eli Lilly, Galderma, Boehringer, Novartis, Pfizer, Sandoz and UCB. E.C. has acted as a speaker or consultant for AbbVie, Almirall, Eli Lilly, LEO Pharma and Novartis. A.D. has served as a speaker, consultant or advisory board member for AbbVie, Almirall, Amgen, Eli Lilly, LEO Pharma, Janssen, Novartis, Boehringer Ingelheim and UCB Pharma outside the submitted work. F.M.G. has acted as a speaker or consultant for Novartis, AbbVie, Eli Lilly, Celgene, LEO Pharma and Almirall. L.G. has been a consultant and/or speaker for and has participated in advisory boards for AbbVie, Almirall, Eli Lilly, Pfizer, Sanofi and UCB Pharma. G.G. has served as a consultant and/or speaker for AbbVie, Almirall, Amgen, Biogen, Boehringer Ingelheim, Bristol Myers Squibb, Eli Lilly, LEO Pharma, Novartis, Pfizer, Samsung, Sanofi and UCB. C.G. has been a scientific consultant, speaker or clinical study investigator for AbbVie, Celgene, Janssen, Eli Lilly, Novartis, Pfizer, Sanofi, Almirall and LEO Pharma. C.L. declares conflicts of interest with AbbVie, Novartis, Lilly and Almirall. F.L. has served on advisory boards for and/or received honoraria for lectures from AbbVie, Janssen-Cilag, Novartis, Lilly and Sanofi. P.M. has been a speaker for AbbVie, Lilly, Novartis, Janssen-Cilag, Celgene, LEO Pharma and Almirall. A.V.M. reports disease-relevant honoraria for consultancy and/or advisory boards from AbbVie, Boehringer Ingelheim, Novartis, Pfizer, Sanofi and UCB. L.M. has served as a speaker and advisory board member for LEO Pharma, Almirall, Novartis, Eli Lilly, Accord, Pierre Fabre, UCB and Johnson & Johnson. G.P. has served as a speaker and/or consultant for AbbVie, Amgen, Almirall, Eli Lilly, Janssen, LEO Pharma, Novartis and UCB outside the submitted work. S.R. has received research grants, travel expenses or consultancy fees from AbbVie, Almirall, LEO Pharma, Johnson & Johnson, L'Oreal, Sanofi, Sandoz, UCB, Eli Lilly, Novartis, BMS and Incyte. E.T. is involved in an intermittent project focused on consulting and/or advisory relationships or/and travel congress support with Eli Lilly, Novartis, Janssen-Cilag, AbbVie and Almirall. N.Z. was a scientific director of Matex Lab. M. Megna has acted as a speaker or consultant for AbbVie, Eli Lilly, Janssen, LEO Pharma and Novartis. L.P., C.A., E.V.D.B., A.D.T., V.D., M. Maurelli, F.M., A.M. and M.T. have no conflicts to declare.

Data availability

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

Ethics statement

Not applicable.

Patient consent

Written patient consent for publication was obtained.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website.

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Appendix 1

Full list of affiliations

[1]Clinical Dermatology Unit, San Gallicano Dermatological Institute, IRCCS, Rome, Italy
[2]Section of Dermatology, Department of Clinical Medicine and Surgery, University of Naples Federico II, Naples, Italy
[3]Scientific Direction, San Gallicano Dermatological Institute, IRCCS, Rome, Italy
[4]Dermatology Unit, IRCCS Humanitas Research Hospital, Rozzano, Milan, Italy
[5]Department of Biomedical Sciences, Humanitas University, Pieve Emanuele, Milan, Italy
[6]Dermatology Unit, Department of Clinical Internal, Anesthesiological and Cardiovascular Science, University of La Sapienza, Rome, Italy
[7]Dermatology Unit, University of Campania L. Vanvitelli, Naples, Italy
[8]Department of Dermatology, Dipartimento di Scienze Della Salute (DISSal), University of Genoa, IRCCS Ospedale Policlinico San Martino, Genoa, Italy
[9]Department of Clinical and Molecular Sciences – Dermatological Clinic, Università Politecnica Delle Marche, Ancona, Italy
[10]Dermatology Unit, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy
[11]Department of Pathophysiology and Transplantation, Università degli Studi di Milano, Milan, Italy
[12]Dermatology Unit, Department of Medicine and Surgery, University of Insubria, Varese, Italy
[13]Department of Medical Science, Dermatology Clinic, University of Turin, Turin, Italy
[14]Department of Clinical and Experimental Medicine, Section of Dermatology, University of Messina, Messina, Italy
[15]Dermatology Unit, Department of Clinical and Experimental Medicine, Ospedale Santa Chiara, Pisa, Italy
[16]Interdisciplinary Center of Health Science, Sant'Anna School of Advanced Studies of Pisa, Pisa, Italy
[17]Department of Dermatology, Dermatology Unit Azienda Ospedaliera San Donato Milanese, Milan, Italy
[18]Section of Dermatology, Department of Medicine, University of Verona, Verona, Italy
[19]Department of Biomedical and Dental Sciences and Morphofunctional Imaging, University of Messina, Messina, Italy
[20]Dermatological Clinic, Department of Specialized Medicine, University of Modena, Modena, Italy
[21]Department of Dermatology, University of Bari, Bari, Italy
[22]U.O.S.D. Dermatologica-Centro per la Cura della Psoriasi, Ospedale Perrino, Brindisi, Italy
[23]Dermatology Unit, Department of Medical, Surgical and Neurological Sciences, University of Siena, Siena, Italy