

Mechanism of Action of Biologics Related to Long-term Drug Survival for Plaque Psoriasis: A Retrospective Cohort Study

Runa Maeda

Oita University Hospital

Ken Shiraiwa

`k-shiraiwa@oita-u.ac.jp`

Oita University Hospital

Ryota Tanaka

Oita University Hospital

Ryosuke Tatsuta

Oita University Hospital

Hiroki Itoh

Oita University Hospital

Research Article

Keywords: plaque psoriasis, biologics, IL-17 inhibitor, IL-23 pathway inhibitor, drug survival, long-term effectiveness

Posted Date: October 14th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10946383/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Biologic agents targeting the interleukin (IL)-17 and IL-23 pathways have become the standard of care for moderate-to-severe plaque psoriasis. However, real-world data on long-term effectiveness remain limited. We investigated whether the mechanism of action of IL-pathway inhibitors influences long-term treatment continuation in plaque psoriasis.

Methods

A retrospective, single-center, cohort study was conducted at Oita University Hospital. Biologic-naïve adult patients with plaque psoriasis but no psoriatic arthritis, who started IL-17, IL-23, or IL-12/23 inhibitor and followed for at least 2 years were included. Primary endpoint was 2-year continuation of the initial biologic. Factors associated with 2-year continuation were evaluated by multivariable logistic regression. Survival analysis was performed comparing IL-17 inhibitors with IL-23 pathway inhibitors (IL-23 and IL-12/23 inhibitors combined).

Results

Sixty-three patients were analyzed: 33 in IL-17 inhibitor group and 30 in IL-23 pathway inhibitor group. Among 57 patients after excluding six with positive switch, 2-year continuation rates were 39.3% (11/28) for IL-17 inhibitors and 72.4% (21/29) for IL-23 pathway inhibitors ($p = 0.017$). Multivariable logistic regression identified mechanism of action as the only independent factor associated with 2-year continuation (odds ratio 3.819; 95% confidence interval [CI]: 1.179–12.371; $p = 0.025$). In survival analysis, IL-23 pathway inhibitors demonstrated significantly higher treatment retention than IL-17 inhibitors (log-rank $p = 0.026$; hazard ratio 0.396; 95% CI: 0.170–0.919; Cox $p = 0.031$).

Conclusion

Among biologic-naïve patients with plaque psoriasis but no coexisting psoriatic arthritis, IL-23 pathway inhibitors demonstrated significantly superior long-term treatment continuation compared with IL-17 inhibitors. Mechanism of action should be considered when selecting a biologic for durable disease control.

1 Introduction

Plaque psoriasis is a chronic, immune-mediated inflammatory skin disease affecting approximately 2–3% of the global population [1]. Dysregulation of the tumor necrosis factor (TNF)- α /interleukin (IL)-23/IL-17 cytokine axis has been established as the central pathogenic driver promoting keratinocyte

proliferation and persistent cutaneous inflammation [2, 3]. Based on this mechanistic knowledge, several classes of biologic agents have been developed and approved for moderate-to-severe plaque psoriasis, including TNF- α inhibitors, IL-12/23 inhibitor (ustekinumab), IL-17 inhibitors (secukinumab, ixekizumab, brodalumab, and bimekizumab), and IL-23 p19 inhibitors (guselkumab, risankizumab, and tildrakizumab).

TNF- α inhibitors were the first biologics developed for psoriasis. However, IL-pathway inhibitors have since demonstrated superior efficacy in randomized controlled trials and network meta-analyses, and are currently the mainstay of biologic therapy [4, 5]. Despite these advances, a subset of patients experiences primary non-response—failure to achieve adequate efficacy—or secondary loss of response—initial improvement followed by disease worsening despite continued treatment [6–9]. These treatment failures necessitate discontinuation or switching, underscoring the importance of selecting biologics with durable long-term effectiveness.

Drug survival, defined as the duration of continuous treatment with a given biologic, is widely employed as a composite real-world surrogate outcome for overall effectiveness, safety, tolerability, and patient satisfaction [10]. European registry studies have reported class-specific differences in drug survival among biologics, with IL-23 inhibitors generally demonstrating favorable persistence [11, 12]. A systematic review and meta-analysis confirmed that guselkumab and risankizumab achieved the highest drug survival rates among IL-17 and IL-23 inhibitors [13]. However, these findings were derived predominantly from Western cohorts, and real-world comparative evidence from Japanese populations remains limited. In addition, most prior real-world drug survival studies included heterogeneous populations comprising both biologic-naïve and -experienced patients, frequently with concurrent psoriatic arthritis [7, 11–15]. Because prior biologic exposure is a strong predictor of reduced persistence, and psoriatic arthritis independently influences both biologic selection and treatment continuation [7, 11, 13, 15–18], these factors may confound the assessment of whether mechanism of action per se affects long-term effectiveness.

In the present research, we retrospectively studied biologic-naïve patients having plaque psoriasis without psoriatic arthritis treated at a single center in Japan. By restricting the study population to this well-defined cohort, we aimed to minimize major confounders and more directly evaluate whether the mechanism of action of IL pathway inhibitors—IL-17 inhibition versus IL-23 pathway inhibition (IL-23 and IL-12/23 inhibitors)—influences 2-year treatment continuation as a surrogate for long-term effectiveness.

2 Methods

2.1 Study design and subjects

This retrospective, single-center cohort study was conducted at Oita University Hospital in Japan. Consecutive adult patients (≥ 18 years) who were diagnosed with plaque psoriasis and initiated the first IL-pathway biologic between January 2013 and December 2024 were screened for eligibility. Inclusion criteria were: (1) a confirmed diagnosis of plaque psoriasis; and (2) initiation of an IL-17 inhibitor, IL-23

inhibitor, or IL-12/23 inhibitor as the first biologic agent. TNF- α inhibitors were excluded because they are no longer commonly selected as first-line biologics for plaque psoriasis in contemporary clinical practice. Exclusion criteria were: (1) prior exposure to any biologic agent; (2) coexisting psoriatic arthritis; and (3) a follow-up period of less than 2 years from biologic initiation. The study protocol was approved by the Ethics Committee of the Faculty of Medicine, Oita University (approval number: 2696), and study was conducted in accordance with the principles of the Declaration of Helsinki. The requirement for written informed consent was waived owing to the retrospective nature of the study; instead, an opt-out method was employed to ensure patients' right to decline participation.

2.2 Biologic classification

Patients were classified into three groups by the mechanism of action of the initial biologic: IL-17 inhibitor group (secukinumab, ixekizumab, brodalumab, and bimekizumab), IL-23 inhibitor group (guselkumab, risankizumab, and tildrakizumab), and IL-12/23 inhibitor group (ustekinumab). For the primary analysis, the IL-23 inhibitor and IL-12/23 inhibitor groups were combined into a single IL-23 pathway inhibitor group, because both classes share the therapeutic mechanism of suppressing the IL-23–driven differentiation and maintenance of pathogenic Th17 cells, in contrast to IL-17 inhibitors, which block the downstream effector cytokine [19].

2.3 Data collection

Data were extracted from electronic medical records. Baseline variables included age at biologic initiation, sex, height, body weight, body mass index (BMI), and laboratory parameters [white blood cell (WBC) count, neutrophil and lymphocyte counts, aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, serum albumin, blood urea nitrogen (BUN), serum creatinine, estimated glomerular filtration rate (eGFR), and C-reactive protein (CRP)]. Data on height, weight, and BMI at the time of biologic initiation were available from only 36 of the 63 patients and are therefore reported for reference only. The eGFR (mL/min/1.73m²) was calculated using the following equation: $194 \times \text{serum creatinine (mg/dL)}^{-1.094} \times \text{age (year)}^{-0.287}$ [20]. For female patients, the result was further multiplied by 0.739.

2.4 Outcome definitions

The primary outcome was continuation of the initial biologic for at least 2 years. Treatment discontinuation was defined as permanent cessation or switching due to any reason, including insufficient efficacy, adverse events, voluntary discontinuation, positive switch (switching to a different biologic for financial reasons or dosing schedule preference, despite adequate disease control), death, or prioritization of cancer treatment. Although body weight, BMI, smoking status, human leukocyte antigen (HLA) genotype, and baseline Psoriasis Area and Severity Index (PASI) have been reported as potential predictors of biologic treatment response in plaque psoriasis [7, 15, 16, 21–25], these variables could not be retrieved from all the eligible patients due to the retrospective design. Because of the substantial proportion of missing data for these variables, they were not included as covariates in the multivariable analysis.

2.5 Statistical analysis

Statistical analysis was performed using SPSS version 30 (IBM Japan Ltd., Tokyo, Japan). All statistical tests were two-sided, with a significance level of $p < 0.05$. Data of baseline patient characteristics and clinical laboratory test values are expressed as numbers for categorical variables and median [interquartile range] for continuous variables. Comparisons between the IL-17 inhibitor group and the IL-23 pathway inhibitor group were performed using the Mann–Whitney U test for continuous variables and Fisher's exact test for categorical variables.

Multivariable logistic regression by the forced-entry method was performed to identify factors independently associated with 2-year continuation. Three factors based on previous reports—the mechanism of action of the initial biologic (IL-17 inhibitor vs. IL-23 pathway inhibitor), sex, and age—were selected as independent variables [7, 15–17, 26]. The selected independent variables for entry into the model were checked for multicollinearity with a variance inflation factor (VIF) threshold of 10, and odds ratios (OR) and 95% confidence intervals (CI) were computed. Additionally, the assumption of linearity in the logit for a continuous variable (age) was evaluated and confirmed using the Box-Tidwell test.

A subsequent survival analysis was conducted to compare long-term effectiveness between the IL-17 inhibitor group and the IL-23 pathway inhibitor group. Treatment continuation was estimated using the Kaplan–Meier method and compared by the log-rank test. A Cox proportional hazards model was fitted using the IL-17 inhibitor group as reference to estimate the hazard ratio (HR) with 95% CI.

Discontinuation of biologic therapy during the 2-year observation period was defined as an event. Moreover, patients who underwent positive switching or remained event-free at the end of the study period were treated as right-censored observations. An exploratory three-group analysis (IL-17 inhibitor, IL-23 inhibitor, and IL-12/23 inhibitor groups separately) was also performed.

3 Results

3.1 Patient characteristics

During the study period, 121 patients were receiving the test biologics for plaque psoriasis. The following patients were excluded based on the exclusion criteria: (1) 47 patients with a history of biologics use, (2) 2 patients with psoriatic arthritis, and (3) 9 patients with follow-up periods less than 2 years after initiation of the biologic. Ultimately, a total of 63 biologic-naïve patients with plaque psoriasis met the eligibility criteria (Table 1). The IL-17 inhibitor group comprised 33 patients and the IL-23 pathway inhibitor group consisted of 30 patients (IL-23 inhibitors, $n = 18$; IL-12/23 inhibitor, $n = 12$). The median age was 49.0 [43.0–60.0] years in the IL-17 inhibitor group and 61.0 [47.8–70.0] years in the IL-23 pathway inhibitor group, with a statistically significant difference between groups ($p = 0.032$). The proportion of male patients was higher in the IL-23 pathway inhibitor group (25/30, 83.3%) than in the IL-17 inhibitor group (22/33, 66.7%), although this difference was not statistically significant ($p = 0.156$). Among the 36 patients from whom anthropometric data were available, height, body weight, and BMI did

not differ significantly between groups. Laboratory parameters at baseline—WBC count, neutrophil and lymphocyte counts, AST, ALT, total bilirubin, serum albumin, serum creatinine, eGFR, and CRP—were comparable between groups, with the exception of BUN, which was significantly higher in the IL-23 pathway inhibitor group (15.0 vs. 12.4 mg/dL; $p = 0.036$).

3.2 Reasons for treatment discontinuation

Reasons for discontinuation during the 2-year observation period are detailed in Table 2. In the IL-17 inhibitor group, 22 of 33 patients (66.7%) discontinued treatment: the most frequent reasons were insufficient efficacy ($n = 7$), followed by positive switch ($n = 5$), voluntary discontinuation ($n = 5$), adverse effect ($n = 3$), and cancer treatment prioritization ($n = 2$). Among individual agents, secukinumab had the highest discontinuation rate (16/22, 72.7%). In the IL-23 pathway inhibitor group, 9 of 30 patients (30.0%) discontinued treatment: the reasons were insufficient efficacy ($n = 2$), adverse effect ($n = 2$), voluntary discontinuation ($n = 2$), positive switch ($n = 1$), unrelated death ($n = 1$), and cancer treatment prioritization ($n = 1$).

3.3 Two-year continuation rates

Using data from 57 patients, after excluding 6 patients who switched to a positive regimen, we calculated the number of days of treatment continuation and the 2-year treatment continuation rate during the observation period (Supplemental Table S1). The median duration of treatment continuation during the 2-year observation period was 600.5 [232.8–730.0] days in the IL-17 inhibitor group and 730.0 [616.0–730.0] days in the IL-23 pathway inhibitor group ($p = 0.022$). The 2-year continuation rate was 39.3% (11/28) in the IL-17 inhibitor group and 72.4% (21/29) in the IL-23 pathway inhibitor group ($p = 0.017$).

3.4 Multivariate analysis of factors associated with 2-year continuation

Multivariable logistic regression by the forced-entry method was performed to identify factors independently associated with 2-year continuation in 57 patients, excluding those who underwent positive switch (Table 3). The covariates were mechanism of action (IL-17 inhibitor = 0, IL-23 pathway inhibitor = 1), sex (female = 0, male = 1), and age. The VIF values for all covariates were below 1.1, indicating no multicollinearity. Prior to the final model interpretation, the linearity of the continuous variable (age) in the logit was verified via the Box-Tidwell test; an interaction term was not significant ($p = 0.193$), indicating that the model specification was appropriate. Among these covariates, only the mechanism of action was identified as a statistically significant factor independently associated with 2-year continuation. Patients receiving IL-23 pathway inhibitors had significantly higher odds of achieving 2-year continuation compared with those receiving IL-17 inhibitors (OR 3.819; 95% CI: 1.179–12.371; $p = 0.025$). Sex (OR 1.964; 95% CI: 0.538–7.164; $p = 0.307$) and age (OR 0.996; 95% CI: 0.961–1.032; $p = 0.817$) were not significantly associated with the 2-year continuation.

3.5 Survival analysis: IL-17 inhibitors versus IL-23 pathway inhibitors

Based on the multivariable analysis, a survival analysis comparing the IL-17 inhibitor group with the IL-23 pathway inhibitor group was subsequently performed (Figure 1). Since patients who underwent positive switching were treated as right-censored observations, the survival analysis was conducted using data from 63 patients. Kaplan–Meier analysis demonstrated significantly longer treatment retention in the IL-23 pathway inhibitor group (log-rank $p = 0.026$). Cox proportional hazards regression using the IL-17 inhibitor group as reference yielded an HR of 0.396 (95% CI: 0.170–0.919; $p = 0.031$), indicating that patients receiving IL-23 pathway inhibitors had approximately 60% lower risk of treatment discontinuation compared with those receiving IL-17 inhibitors.

An exploratory three-group survival analysis comparing IL-17, IL-23, and IL-12/23 inhibitor groups showed trends consistent with the primary two-group analysis but did not reach statistical significance (log-rank $p = 0.082$; Cox $p = 0.097$; Supplemental Figure 1).

4 Discussion

In this single-center retrospective cohort study of biologic-naïve patients with plaque psoriasis but no coexisting psoriatic arthritis, the mechanism of action of IL-pathway inhibitors was identified as the only statistically significant factor independently associated with 2-year treatment continuation. Patients receiving IL-23 pathway inhibitors (IL-23 and IL-12/23 inhibitors combined) had 3.819-fold higher odds of continuing treatment for 2 years compared with those receiving IL-17 inhibitors, and subsequent survival analysis confirmed a significantly lower risk of discontinuation (HR 0.396; $p = 0.031$) in patients receiving IL-23 pathway inhibitors.

These findings are broadly consistent with large real-world studies conducted predominantly in Western populations. In a British Association of Dermatologists Biologics and Immunomodulators Register (BADBIR) cohort study, IL-23 inhibitors demonstrated the longest drug survival among biologic classes, with patients persisting with IL-23 inhibitors approximately 21 weeks longer for effectiveness compared with other biologics over a 2-year period [11]. An Italian multicenter study of 5,932 treatment courses similarly reported that risankizumab exhibited the highest drug survival at 4 years [12]. A systematic review and meta-analysis confirmed that guselkumab and risankizumab achieved the highest overall drug survival rates among IL-17 and IL-23 inhibitors [13]. Furthermore, a meta-analysis of drug survival studies using hazard ratio data demonstrated that ustekinumab had longer drug survival than TNF inhibitors and IL-17 inhibitors [14]. The present study extends these findings by demonstrating comparable trends in a Japanese biologic-naïve cohort without psoriatic arthritis.

Several factors may underlie the superior long-term effectiveness of IL-23 pathway inhibitors. First, IL-23 occupies an upstream position in the pathogenic cascade, driving the differentiation, survival, and pathogenic functions of Th17 cells [19]. Blockade at this upstream level may provide more sustained suppression of downstream inflammatory networks than selective inhibition of the effector cytokine IL-17A, leaving other mediators such as IL-17F and IL-22 relatively unaffected [27]. This concept is supported by clinical evidence indicating that IL-23 blockade demonstrates more durable responses,

whereas IL-17 inhibition is associated with a more rapid onset of action but potentially greater susceptibility to secondary loss of response [28, 29]. Second, less frequent maintenance dosing schedules for IL-23 inhibitors and the IL-12/23 inhibitor (every 8–12 weeks) may contribute to enhance adherence and persistence. Third, immunogenicity-related secondary loss of response may differ across biologic classes, although direct comparative data remain limited [30, 31].

In the primary analysis, the IL-23 inhibitors and IL-12/23 inhibitor were combined into a single IL-23 pathway inhibitor group. Ustekinumab targets the p40 subunit shared by IL-12 and IL-23, thereby inhibiting IL-23 signaling alongside IL-12, whereas the IL-23 p19 inhibitors selectively target IL-23 [19]. Despite this pharmacological distinction, both classes exert their therapeutic effect on psoriasis primarily through suppression of the IL-23–driven maintenance of pathogenic Th17 cells, distinguishing them mechanistically from IL-17 inhibitors, which act at the downstream effector level. The exploratory three-group analysis (Supplemental Figure S1) showed trends consistent with the primary analysis but did not reach statistical significance, likely due to the modest sample size in each subgroup. When combined, the IL-23 pathway inhibitor group demonstrated a clear and statistically significant advantage, supporting the validity of this mechanistic grouping.

The IL-23 pathway inhibitor group was significantly older than the IL-17 inhibitor group (median 61.0 vs. 49.0 years; $p = 0.032$). This age difference may reflect prescribing preferences, as IL-23 and IL-12/23 inhibitors with less frequent dosing schedules may be preferentially prescribed for older patients. Notably, although older age is a potential negative predictor of biologic treatment response [16], the IL-23 pathway inhibitor group nonetheless demonstrated superior long-term continuation. Moreover, age was not significantly associated with 2-year continuation in the multivariable analysis (OR 0.996; $p = 0.817$), and the VIF values confirmed no multicollinearity. BUN was also significantly higher in the IL-23 pathway inhibitor group, which likely reflects the age difference but does not suggest a clinically meaningful difference in renal function, as eGFR did not differ between groups.

To our knowledge, this is the first study to compare the long-term effectiveness of IL-17 inhibitors and IL-23 pathway inhibitors, specifically in a Japanese cohort. Given the differences in genetic background of psoriasis (such as the frequency of HLA-C*06:02), body composition, and healthcare reimbursement systems between Japanese and Western populations, independent validation of treatment outcomes in Japanese cohorts has important clinical relevance. Furthermore, restricting the study to biologic-naïve patients without psoriatic arthritis distinguishes this study from most prior real-world drug survival studies, which typically included mixed populations of biologic-naïve and -experienced patients with or without psoriatic arthritis [7, 11, 12, 14, 15, 17, 18]. Prior biologic exposure has consistently been associated with reduced subsequent treatment response and shorter drug survival [13, 16–18], and the presence of psoriatic arthritis can independently influence biologic selection and treatment persistence [7, 11, 15, 17]. By excluding these populations, the present analysis minimized two major sources of confounding and enabled a cleaner assessment of the effect of mechanism of action on long-term effectiveness. The identification of mechanism of action as the sole significant predictor, with a robust

odds ratio of 3.819, provides clinically actionable information for treatment selection in biologic-naïve patients.

This study has several limitations. First, it is a single-center retrospective study with a modest sample size ($n = 63$), which limits statistical power and likely resulted in no significant differences in the three-group analysis. Second, data on smoking status, HLA genotype, and baseline PASI were unavailable from most patients and could not be included as covariates. Anthropometric data (height, weight, BMI) were available from only 36 patients; although they did not differ between groups, their potential confounding effect cannot be completely excluded. Residual confounding by unmeasured variables is an inherent limitation. Third, treatment allocation was not randomized, and changes in prescribing pattern over time may have introduced selection bias. Ustekinumab, available from the earliest years of the study period, and newer IL-23 p19 inhibitors may have been prescribed to different patient subsets. The significant age difference between groups may partially reflect such temporal trends. Fourth, drug survival was used as a composite surrogate for long-term effectiveness, but detailed PASI response trajectories and patient-reported outcomes were not systematically available. Finally, validation in larger, multicenter, prospective cohorts of Japanese or Asian patients is warranted.

5 Conclusion

In biologic-naïve patients having plaque psoriasis without psoriatic arthritis, the mechanism of action of IL-pathway biologics was identified as the only significant factor associated with 2-year treatment continuation. IL-23 pathway inhibitors (IL-23 and IL-12/23 inhibitors combined) demonstrated significantly superior long-term effectiveness compared with IL-17 inhibitors. These findings suggest that the mechanism of action, particularly IL-23 pathway inhibition, should be considered when selecting a biologic for durable long-term disease control in biologic-naïve patients, although validation in larger cohorts is warranted.

Declarations

Running head

Drug survival of Biologics for Plaque Psoriasis

Conflict of interest:

The authors declare no conflicts of interest.

Declarations

Conflicts of Interest

The authors declare no conflicts of interest

Ethical Approval

This retrospective study involving human participants was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The clinical study protocol was approved by the Ethics Committee of Oita University Faculty of Medicine (approval number: 2696).

Funding

None.

Author Contribution

Study design: Ken Shiraiwa; Data collection: Runa Maeda, Ken Shiraiwa; Data analysis: Runa Maeda, Ken Shiraiwa, Ryota Tanaka; Supervision: Ken Shiraiwa, Ryota Tanaka; Writing of the original version: Runa Maeda, Ken Shiraiwa; Review and revision: Ryota Tanaka, Ryosuke Tatsuta, Hiroki Itoh; Approval: All authors.

Data Availability

The data sets generated during this study are available from the corresponding author on responsible request.

Tables

Tables 1-3 are available in the Supplementary Files section.

References

1. Parisi R, Iskandar IYK, Kontopantelis E, Augustin M, Griffiths CEM, Ashcroft DM, Global Psoriasis A (2020) National, regional, and worldwide epidemiology of psoriasis: systematic analysis and modelling study. *BMJ* 369:m1590. <https://doi.org/10.1136/bmj.m1590>
2. Hawkes JE, Chan TC, Krueger JG (2017) Psoriasis pathogenesis and the development of novel targeted immune therapies. *J Allergy Clin Immunol* 140:645–653. <https://doi.org/10.1016/j.jaci.2017.07.004>
3. Hawkes JE, Yan BY, Chan TC, Krueger JG (2018) Discovery of the IL-23/IL-17 Signaling Pathway and the Treatment of Psoriasis. *J Immunol* 201:1605–1613. <https://doi.org/10.4049/jimmunol.1800013>

4. Sbidian E, Chaimani A, Garcia-Doval I, Doney L, Dressler C, Hua C, Hughes C, Naldi L, Afach S, Le Cleach L (2022) Systemic pharmacological treatments for chronic plaque psoriasis: a network meta-analysis. *Cochrane Database Syst Rev* 5:CD011535. <https://doi.org/10.1002/14651858.CD011535.pub5>
5. Armstrong AW, Puig L, Joshi A, Skup M, Williams D, Li J, Betts KA, Augustin M (2020) Comparison of Biologics and Oral Treatments for Plaque Psoriasis: A Meta-analysis. *JAMA Dermatol* 156:258–269. <https://doi.org/10.1001/jamadermatol.2019.4029>
6. Haderler E, Kumar S, Yeroushalmi S, Hong J, Wallace E, Han G, Mosca M, Bartholomew E, Chung M, Hakimi M, Reddy S, Scher J, Bhutani T, Gondo G, Armstrong A, Bell S, Liao W (2023) Factors Associated with Multi-Biologic Use in Psoriasis Patients at an Academic Medical Center and Review of Biologic Survival. *J Psoriasis Psoriatic Arthritis* 8:11–18. <https://doi.org/10.1177/24755303221131259>
7. Mourad A, Straube S, Armijo-Olivo S, Gniadecki R (2019) Factors predicting persistence of biologic drugs in psoriasis: a systematic review and meta-analysis. *Br J Dermatol* 181:450–458. <https://doi.org/10.1111/bjd.17738>
8. Mortato E, Talamonti M, Marcelli L, Megna M, Raimondo A, Caldarola G, Bernardini N, Balato A, Campanati A, Esposito M, Bonifati C, Lora V, Potestio L, Lembo S, Loconsole F, De Luca E, Skroza N, Buononato D, Bianchelli T, Fargnoli MC, Tommasino N, Foti C, De Simone C, Bianchi L, Galluzzo M (2025) Long-Term Real-World Effectiveness and Drug Survival of Guselkumab in Patients with Psoriasis: A 5-Year Retrospective Study. *Psoriasis (Auckl)* 15:455–469. <https://doi.org/10.2147/PTT.S533005>
9. Lin PT, Wang SH, Chi CC (2018) Drug survival of biologics in treating psoriasis: a meta-analysis of real-world evidence. *Sci Rep* 8:16068. <https://doi.org/10.1038/s41598-018-34293-y>
10. van den Reek J, Kievit W, Gniadecki R, Goeman JJ, Zweegers J, van de Kerkhof PCM, Seyger MMB, de Jong E (2015) Drug Survival Studies in Dermatology: Principles, Purposes, and Pitfalls. *J Invest Dermatol* 135:1–5. <https://doi.org/10.1038/jid.2015.171>
11. Motedayen Aval L, Yiu ZZN, Alabas OA, Griffiths CEM, Reynolds NJ, Hampton PJ, Smith CH, Warren RB, Group BS (2025) Drug survival of IL-23 and IL-17 inhibitors versus other biologics for psoriasis: A British Association of Dermatologists Biologics and Immunomodulators Register cohort study. *J Eur Acad Dermatol Venereol* 39:1785–1795. <https://doi.org/10.1111/jdv.20739>
12. Gargiulo L, Ibba L, Malagoli P, Balato A, Bardazzi F, Burlando M, Carrera CG, Damiani G, Dapavo P, Dini V, Gaiani FM, Girolomoni G, Guarneri C, Lasagni C, Loconsole F, Marzano AV, Megna M, Mercuri SR, Travaglini M, Costanzo A, Narcisi A (2023) Drug survival of IL-12/23, IL-17 and IL-23 inhibitors for moderate-to-severe plaque psoriasis: a retrospective multicenter real-world experience on 5932 treatment courses - IL PSO (Italian landscape psoriasis). *Front Immunol* 14:1341708. <https://doi.org/10.3389/fimmu.2023.1341708>
13. Thomas SE, Barenbrug L, Hannink G, Seyger MMB, de Jong E, van den Reek J (2024) Drug Survival of IL-17 and IL-23 Inhibitors for Psoriasis: A Systematic Review and Meta-Analysis. *Drugs* 84:565–

578. <https://doi.org/10.1007/s40265-024-02028-1>
14. Mourad AI, Gniadecki R (2020) Biologic Drug Survival in Psoriasis: A Systematic Review & Comparative Meta-Analysis. *Front Med (Lausanne)* 7:625755. <https://doi.org/10.3389/fmed.2020.625755>
 15. Warren RB, Smith CH, Yiu ZZN, Ashcroft DM, Barker J, Burden AD, Lunt M, McElhone K, Ormerod AD, Owen CM, Reynolds NJ, Griffiths CEM (2015) Differential Drug Survival of Biologic Therapies for the Treatment of Psoriasis: A Prospective Observational Cohort Study from the British Association of Dermatologists Biologic Interventions Register (BADBIR). *J Invest Dermatol* 135:2632–2640. <https://doi.org/10.1038/jid.2015.208>
 16. Hjort G, Schwarz CW, Skov L, Loft N (2024) Clinical Characteristics Associated With Response to Biologics in the Treatment of Psoriasis: A Meta-analysis. *JAMA Dermatol* 160:830–837. <https://doi.org/10.1001/jamadermatol.2024.1677>
 17. Oh S, Choi S, Yoon HS (2022) Available Alternative Biologics and Disease Groups Influence Biologic Drug Survival in Patients with Psoriasis and Psoriatic Arthritis. *Ann Dermatol* 34:321–330. <https://doi.org/10.5021/ad.22.003>
 18. Schwarz CW, Loft N, Bryld LE, Nissen CV, Ajgeiy KK, Bertelsen T, Hjuler KF, Dam TN, Iversen L, Rasmussen MK, Skov L (2026) Drug Survival of Biologics in Bionative and Bioexperienced Patients With Psoriasis. *JAMA Dermatol* 162:166–175. <https://doi.org/10.1001/jamadermatol.2025.5205>
 19. Teng MW, Bowman EP, McElwee JJ, Smyth MJ, Casanova JL, Cooper AM, Cua DJ (2015) IL-12 and IL-23 cytokines: from discovery to targeted therapies for immune-mediated inflammatory diseases. *Nat Med* 21:719–729. <https://doi.org/10.1038/nm.3895>
 20. Matsuo S, Imai E, Horio M, Yasuda Y, Tomita K, Nitta K, Yamagata K, Tomino Y, Yokoyama H, Hishida A Collaborators developing the Japanese equation for estimated GFR (2009) Revised equations for estimated GFR from serum creatinine in Japan. *Am J Kidney Dis* 53:982–992. <https://doi.org/10.1053/j.ajkd.2008.12.034>
 21. Schwarz CW, Loft N, Rasmussen MK, Nissen CV, Dam TN, Ajgeiy KK, Egeberg A, Skov L (2021) Predictors of Response to Biologics in Patients with Moderate-to-severe Psoriasis: A Danish Nationwide Cohort Study. *Acta Derm Venereol* 101:adv00579. <https://doi.org/10.2340/actadv.v101.351>
 22. van Vugt LJ, van den Reek J, Hannink G, Coenen MJH, de Jong E (2019) Association of HLA-C*06:02 Status With Differential Response to Ustekinumab in Patients With Psoriasis: A Systematic Review and Meta-analysis. *JAMA Dermatol* 155:708–715. <https://doi.org/10.1001/jamadermatol.2019.0098>
 23. Pirro F, Caldarola G, Chiricozzi A, Burlando M, Mariani M, Parodi A, Peris K, De Simone C (2021) Impact of Body Mass Index on the Efficacy of Biological Therapies in Patients with Psoriasis: A Real-World Study. *Clin Drug Investig* 41:917–925. <https://doi.org/10.1007/s40261-021-01080-z>
 24. Chen L, Tsai TF (2018) HLA-Cw6 and psoriasis. *Br J Dermatol* 178:854–862. <https://doi.org/10.1111/bjd.16083>

25. Hirata J, Hirota T, Ozeki T, Kanai M, Sudo T, Tanaka T, Hizawa N, Nakagawa H, Sato S, Mushiroda T, Saeki H, Tamari M, Okada Y (2018) Variants at HLA-A, HLA-C, and HLA-DQB1 Confer Risk of Psoriasis Vulgaris in Japanese. *J Invest Dermatol* 138:542–548.
<https://doi.org/10.1016/j.jid.2017.10.001>
26. Chiricozzi A, Coscarella G, Puig L, Vender R, Yeung J, Carrascosa JM, Piaserico S, Gisondi P, Lynde C, Ferreira P, Bastos PM, Dauden E, Leite L, Valerio J, Del Alcazar-Viladomiu E, Vilarrasa E, Llamas-Velasco M, Alessandri-Bonetti M, Messina F, Bruni M, Di Brizzi EV, Ricceri F, Nidegger A, Hugo J, Mufti A, Daponte AI, Teixeira L, Balato A, Romanelli M, Prignano F, Gkalkakiotis S, Conrad C, Lazaridou E, Rompoti N, Stratigos AJ, Nogueira M, Peris K, Torres T (2024) Age affects drug survival rates of interleukin (IL)-17 and IL-23 inhibitors in patients with plaque psoriasis: Results from a retrospective, multicentric, multi-country, cohort study. *J Eur Acad Dermatol Venereol* 38:2175–2185. <https://doi.org/10.1111/jdv.20143>
27. Brembilla NC, Senra L, Boehncke WH (2018) The IL-17 Family of Cytokines in Psoriasis: IL-17A and Beyond. *Front Immunol* 9:1682. <https://doi.org/10.3389/fimmu.2018.01682>
28. Bai F, Li GG, Liu Q, Niu X, Li R, Ma H (2019) Short-Term Efficacy and Safety of IL-17, IL-12/23, and IL-23 Inhibitors Brodalumab, Secukinumab, Ixekizumab, Ustekinumab, Guselkumab, Tildrakizumab, and Risankizumab for the Treatment of Moderate to Severe Plaque Psoriasis: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials. *J Immunol Res* 2019:2546161.
<https://doi.org/10.1155/2019/2546161>
29. Mastorino L, Dapavo P, Susca S, Cariti C, Siliquini N, Verrone A, Stroppiana E, Ortoncelli M, Quaglino P, Ribero S (2024) Drug survival and clinical effectiveness of secukinumab, ixekizumab, brodalumab, guselkumab, risankizumab, tildrakizumab for psoriasis treatment. *J Dtsch Dermatol Ges* 22:34–42.
<https://doi.org/10.1111/ddg.15251>
30. Hsu L, Armstrong AW (2013) Anti-drug antibodies in psoriasis: a critical evaluation of clinical significance and impact on treatment response. *Expert Rev Clin Immunol* 9:949–958.
<https://doi.org/10.1586/1744666X.2013.836060>
31. Sun X, Cui Z, Wang Q, Liu L, Ding X, Wang J, Cai X, Li B, Li X (2024) Formation and clinical effects of anti-drug antibodies against biologics in psoriasis treatment: An analysis of current evidence. *Autoimmun Rev* 23:103530. <https://doi.org/10.1016/j.autrev.2024.103530>

Figures

FIGURE 1

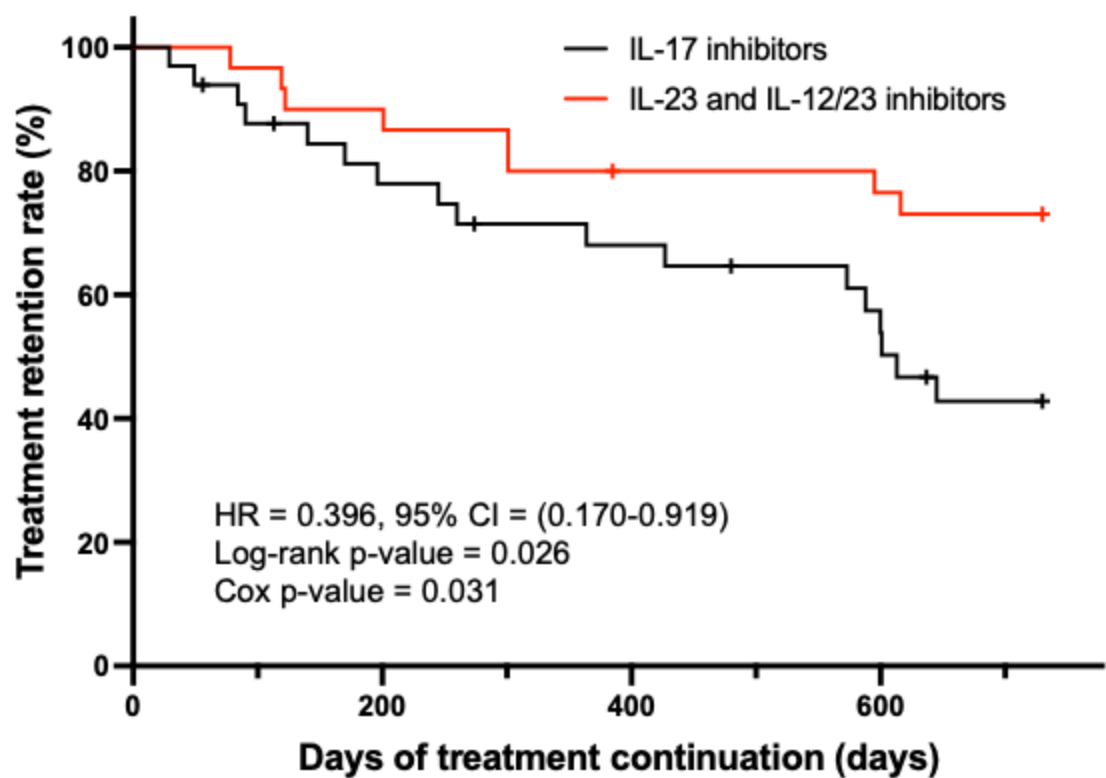


Figure 1

Kaplan–Meier curves for biologic retention rate in patients with plaque psoriasis, comparing the IL-17 inhibitor group and the IL-23 pathway inhibitor group.

The x-axis represents the duration of treatment continuation from biologic initiation (days), and the y-axis represents the biologic retention rate (%). The black line represents IL-17 inhibitors, and the red line denotes IL-23 pathway inhibitors. HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [TableBioforPsoriasisFinal.docx](#)
- [SupplementalFigureBioforPsoriasisFinal.tiff](#)
- [SupplementalTableBioforPsoriasisFinal.docx](#)