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Biologic Treatment in Elderly Patients with Psoriasis: Focus on Safety and Adherence

Gizem Pehlivan Ulutaş[1], Tuğba Özkök Akbulut[2]

1 Department of Dermatology and Venereology, Haseki Training and Research Hospital, Istanbul, Turkey
2 Department of Dermatology and Venereology, Liv Hospital Ulus, Istanbul, Turkey

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Corresponding Author: Gizem Pehlivan Ulutaş, MD, Department of Dermatology and Venereology, Haseki Training and Research Hospital, Ugur Mumcu Mah. Belediye Sok. No:7. Sultangazi, Istanbul, Turkey. ORCID ID: 0000-0002-5906-3976. E-mail: gizempehlivan93@gmail.com.

ABSTRACT

Introduction: The number of elderly psoriasis patients is increasing, yet data on biological treatments in this population remains limited.

Objectives: To evaluate the characteristics, efficacy, and safety of biologics in psoriasis patients aged ≥65 years and identify factors contributing to treatment interruption or discontinuation.

Methods: The study included psoriasis patients aged ≥65 years who had received at least one biological treatment at a tertiary center for a minimum of 24 weeks between 2022 and 2024. Demographic and clinical data, treatment history, PASI scores, adverse events, and reasons for treatment interruption or discontinuation were evaluated.

Results: Among 231 patients on biologics, 43 (18.6%) were aged ≥65 years (mean age: 70.2 ± 4.8 years, male-to-female ratio: 2:1). Mean PASI scores improved from 14.5 ± 8.8 at baseline to 1.5 ± 1.5 at weeks 12–16, and to 0.83 ± 1.2 at week 52. Latent tuberculosis and anti-HBc positivity were common (65.1% and 51.2%, respectively), but no reactivation occurred. Adverse events were reported in 39.5% of patients, most commonly infections (27.9%). Treatment-ending events occurred in 7.0%, all due to malignancies. Treatment interruptions occurred in 20.9%, mainly due to noncompliance, transportation difficulties, and comorbidities. Notably, 20.9% of the patients required assistance to attend their hospital visits, and 44.2% required help administering their drug. Treatment was discontinued in 16.3%, primarily due to malignancies and secondary failure.

Conclusions: Biologics are effective in psoriasis patients aged ≥65 years. A relatively high malignancy rate emphasizes the importance of age-appropriate screening. Noncompliance, comorbidities, transportation problems, and healthcare access barriers may pose challenges in long-term treatment maintenance.

Introduction

Psoriasis is a common chronic immune-mediated inflammatory disease that affects the skin, joints, and nails. Its prevalence varies significantly across countries but is approximately 2–3% in Western populations [1,2]. The disease can manifest at any age, with incidence increasing up to age 39, followed by a second peak during the sixth and seventh decades [1]. Due to its chronic nature, the highest disease burden is observed in the 60–69 age group [3], making it one of the most common geriatric dermatological conditions in outpatient clinics [4]. With the aging global population, the number of elderly psoriasis patients is expected to increase.

Nearly 15% of elderly psoriasis patients experience moderate-to-severe disease and are candidates for systemic treatments [5]. Managing psoriasis in this population presents unique challenges due to a high prevalence of comorbidities and polypharmacy, which increase the risk of drug interactions and adverse events [6-8]. Additionally, cognitive decline, socioeconomic challenges, and physical mobility limitations further complicate the treatment adherence and follow-up [6,9].

Biologic drugs have revolutionized psoriasis management and are particularly appealing in the elderly due to their targeted mechanisms, minimal risk of drug interactions, and reduced need for frequent dosing and hospital visits. However, their immunosuppressive nature raises concerns regarding infections and malignancies, which are already more prevalent in older adults [5,10,11]. Furthermore, elderly patients are underrepresented in randomized controlled trials, leading to limited data on the safety and efficacy of biologics in this group. Consequently, real-world clinical studies play a crucial role in guiding clinical decisions [12-19]. While some retrospective studies have focused on biologic use in elderly psoriasis patients, there is still an unmet need for more studies on the safety and efficacy of these treatments. Furthermore, the issues of adherence and treatment interruptions specific to elderly patients treated with biologics have not been thoroughly addressed despite these being quite common in clinical practice.

Objectives

The present study aimed to evaluate the characteristics of psoriasis patients aged ≥65 years, assess the efficacy and safety of biologic treatments, and identify factors contributing to treatment interruption or discontinuation. Thus, we expected to provide more insight into the disease and treatment characteristics of this population and improve patient care.

Methods

This retrospective study was conducted at a tertiary reference center with a specialized psoriasis outpatient clinic. The records of psoriasis patients treated with biologic drugs between 2022 and 2024 were reviewed. Patients aged ≥65 years who had received at least one biologic drug for a minimum of 24 weeks and had complete demographic, clinical, and treatment data were included in the study.

Demographic and clinical variables collected included sex, age, age at disease onset, family history of psoriasis in first-degree relatives, weight, body mass index (BMI), presence of psoriatic arthritis, and involvement of special areas such as the scalp, nails, palms, soles, and genitals. Additional data included comorbidities and polypharmacy, which is defined as the concurrent use of at least five systemic medications (excluding anti-psoriatics). Information on previous systemic treatments, reasons for discontinuation of prior biological therapies, and PASI scores for the last prescribed biologic at baseline, weeks 12–16, week 52, and the last follow-up visit were also recorded.

Safety was assessed through regular monitoring of adverse events, physical examinations, and laboratory tests. Complete blood count and biochemistry tests were conducted every three months, while chest X-rays were performed at the start of treatment and subsequently every six months. Hepatitis and HIV serology, along with the interferon-gamma release assay, were conducted at the start of treatment and repeated annually in patients with negative initial results.

Patients who suspended their biological treatment for a duration equivalent to at least four half-lives of the relevant drug and subsequently resumed treatment were classified as having treatment interruption, and the reasons for these interruptions were recorded. This definition was based on pharmacokinetic principles as the time required for a drug to be cleared from the body. This time frame has also been recommended in earlier psoriasis treatment guidelines as a standard washout period when switching from one biologic to another [20]. Additionally, the frequency and reasons for treatment discontinuation were evaluated in patients

whose treatment was terminated permanently. Furthermore, whether patients required assistance with attending hospital visits or administering their biological treatments was recorded. Frailty or dependency status was not routinely documented in the clinical records and therefore could not be assessed due to the retrospective nature of the study.

The study received approval from the institutional review board and was conducted in accordance with the Declaration of Helsinki (approval number: 13-2025).

Data were analyzed using SPSS® Statistics for Windows (version 26; IBM Corp, Armonk, New York, USA). Continuous variables were expressed as mean ± standard deviation and categorical variables as numbers and percentages.

Results

Among the 231 psoriasis patients treated with biologics, 43 patients (18.6%) with a mean age of 70.2 ± 4.8 years (range 65–81) and a male-to-female ratio of 2:1 were included in the study. The patient characteristics are summarized in Table 1. Nine patients had coexisting psoriatic arthritis (20.9%). All patients except one (97.7%) had involvement of at least one special area, with scalp (N=33, 76.7%) and nails (N=31, 72.1%) being the most frequent sites.

Comorbidities and Polypharmacy

Thirty-nine patients (90.7%) had at least one systemic comorbidity, with hypertension (58.1%) and dyslipidemia (46.5%) being the most common (Table 1). Previous malignancy was detected in two cases (4.7%), one with invasive squamous cell carcinoma and the other with bladder cancer. Polypharmacy was observed in 39.5% of cases.

Tuberculosis and Hepatitis B Screening, Prophylaxis, and Reactivation

Latent tuberculosis infection (LTBI) was detected in 65.1% of patients (N=28) via a positive QuantiFERON-TB test. Among these, 27 cases (62.8%) were diagnosed with LTBI before starting biological treatment, while one case experienced QuantiFERON-TB conversion during biological treatment. Isoniazid prophylaxis was initiated in all cases but discontinued in four patients, with one case each due to hepatotoxicity, diarrhea, allergic reactions, and nonadherence. Rifampicin prophylaxis was completed in one of these cases. No tuberculosis reactivation occurred during follow-up.

Serologic evidence of hepatitis B infection (anti-HBc IgG positivity) was identified in 51.2% of patients (N=22), categorized as chronic inactive (N=1, 2.3%), occult (N=2, 4.7%), and resolved (N=19, 44.2%) infections. Antiviral prophylaxis was administered to seven patients. No case of hepatitis B reactivation was detected during follow-up.

Previous Systemic Treatments and Reasons for Treatment Discontinuation of Previous Biological Treatments

Previous systemic treatments are listed in Table 1. In total, 14 patients had previous biological treatment experience, and 21 biological treatment episodes were discontinued across these patients. Secondary failure was the most common reason for treatment discontinuation (19 out of 21 treatment episodes). Additionally, one patient discontinued treatment due to exacerbation of ulcerative colitis and another following a cerebrovascular event.

Efficacy, Safety, and Adherence to the Last Biological Treatment

Guselkumab (N=13, 30.2%), risankizumab (N=12, 27.9%), and ixekizumab (N=11, 25.6%) were the most frequently prescribed biologics (Table 2).

The mean PASI score at baseline (week 0) was 14.5 ± 8.8 (range 6.0–44.0). During treatment, the PASI score improved to 1.5 ± 1.5 (range 0.0–6.0) at weeks 12–16 and further to 0.83 ± 1.2 (range 0.0–4.5) at week 52. At the last visit, after a mean treatment duration of 117 weeks (range 24–520), the mean PASI score was 1.4 ± 1.8 (range 0.0–6.6).

Adverse events were recorded in 39.5% of the patients, with infections and infestations being the most common (N=12, 27.9%) (Figure 1). Three patients (7.0%) developed malignancies during treatment: one case each of colon cancer, bladder cancer, and basal cell carcinoma. Additionally, one patient experienced a cerebrovascular accident (2.3%).

Treatment was interrupted in 20.9% of the cases due to various reasons, including patient noncompliance (11.6%), transportation issues (7.0%), comorbid medical conditions (4.7%), and limited access to healthcare (2.3%). In some cases, multiple factors contributed to treatment interruptions.

In total, 20.9% of the patients required assistance in attending their hospital visits, and 44.2% required help administering their biologic drug.

Treatment was discontinued in seven patients (16.3%), and it was attributed to malignancies (7.0%), secondary treatment failure (4.7%), loss to follow-up (2.3%), and cardiovascular failure leading to death (2.3%). The death was assessed as unrelated to biological treatment.

Discussion

The underrepresentation of elderly patients in randomized clinical trials has resulted in most data on biologics use in this population being derived from real-world studies. Since anti-TNF drugs have been available the longest, the majority of the data pertains to them [5]. A 2014 study from Italy involving 187 elderly patients treated with conventional and biological therapies identified etanercept

Table 1. Demographic and clinical characteristics of patients and previous systemic treatments.

	Total group (N=43)
Gender, n (%): male/female	29 (67.4) / 14 (32.6)
Age, mean±sd	70.2 ± 4.8
Age at disease onset, mean±sd	43.5 ± 17.2
Disease duration, years, mean±sd	26.8 ± 16.6
Psoriasis in first-degree relatives, N (%)	8 (18.6)
Bodyweight, kg, mean±sd	79.1 ± 12.6
Body mass index, mean±sd	28.4 ± 4.2
Polypharmacy, N (%)	17 (39.5)
Biologics experienced, N (%)	14 (32.6)
Baseline PASI, mean±sd	14.5 ± 8.8
Psoriatic arthritis, N (%)	9 (20.9)
Comorbidities	**N (%)**
Hypertension	25 (58.1)
Dyslipidemia	20 (46.5)
Obesity	14 (32.6)
Coronary artery disease	14 (32.6)
Hepatosteatosis	14 (32.6)
Diabetes mellitus	13 (30.2)
Chronic renal failure	9 (20.9)
Psychiatric comorbidities	6 (14.0)
Cerebrovascular disease	5 (11.6)
Thyroid disease	5 (11.6)
Atrial fibrillation/arrhythmia	4 (9.3)
COPD/Asthma	4 (9.3)
Neurodegenerative disease	3 (7.0)
Previous malignancy	2 (4.7)
Inflammatory bowel disease	1 (2.3)
Latent tuberculosis infection N (%)	28 (65.1)
Hepatitis B immune status	
Chronic inactive	1 (2.3)
Occult	2 (4.7)
Resolved	19 (44.2)
Vaccinated	4 (9.3)
Non-immune	17 (39.5)
Special area involvement	**N (%)**
Nails	31 (72.1)
Scalp	33 (76.7)
Intertriginous	12 (27.9)
Palmoplantar	9 (20.9)
Previous systemic treatments	**N (%)**
Narrowband UVB	15 (34.9)
Methotrexate	31 (72.1)
Acitretin	20 (46.5)
Cyclosporine	6 (14.0)
Etanercept	5 (11.6)
Adalimumab	2 (4.7)
Certolizumab	1 (2.3)
Ustekinumab	6 (14.0)
Secukinumab	2 (4.7)
Ixekizumab	3 (7.0)
Risankizumab	2 (4.7)

Abbreviations: sd: standard deviation, kg: kilograms, PASI: Psoriasis Area and Severity Index, COPD: chronic obstructive pulmonary disease, NMSC: nonmelanoma skin cancer

Table 2. Treatment details regarding the last biological treatment.

Last Prescribed Biological Drug	N (%)
Guselkumab	13 (30.2)
Risankizumab	12 (27.9)
Ixekizumab	11 (25.6)
Ustekinumab	3 (7.0)
Adalimumab	1 (2.3)
Etanercept	1 (2.3)
Infliximab	1 (2.3)
Secukinumab	1 (2.3)
Treatment duration, weeks, mean±sd (range)	117.1 ± 76.3 (24 – 520)
PASI scores mean±sd (range)	
Baseline	14.5 ± 8.8 (6.0 – 44.0)
Week 12-16	1.5 ± 1.5 (0.0 – 6.0)
Week 52	0.83 ± 1.2 (0.0 – 4.5)
Last visit	1.4 ± 1.8 (0.0 – 6.6)
Frequency and reasons for treatment interruption n (%)*	**9 (20.9)**
Patient noncompliance	5 (11.6)
Transportation issues	3 (7.0)
Comorbid medical conditions	2 (4.7)
Limited access to healthcare	1 (2.3)
Frequency and reasons for treatment discontinuation n (%)	**7 (16.3)**
Malignancy • Solid organ malignancies • NMSC	3 (7.0) 2 (4.7) 1 (2.3)
Secondary failure	2 (4.7)
Lost to follow-up	1 (2.3)
Death	1 (2.3)

Abbreviations: sd: standard deviation, NMSC: nonmelanoma skin cancer, *For some cases, multiple factors contributed to treatment interruptions.

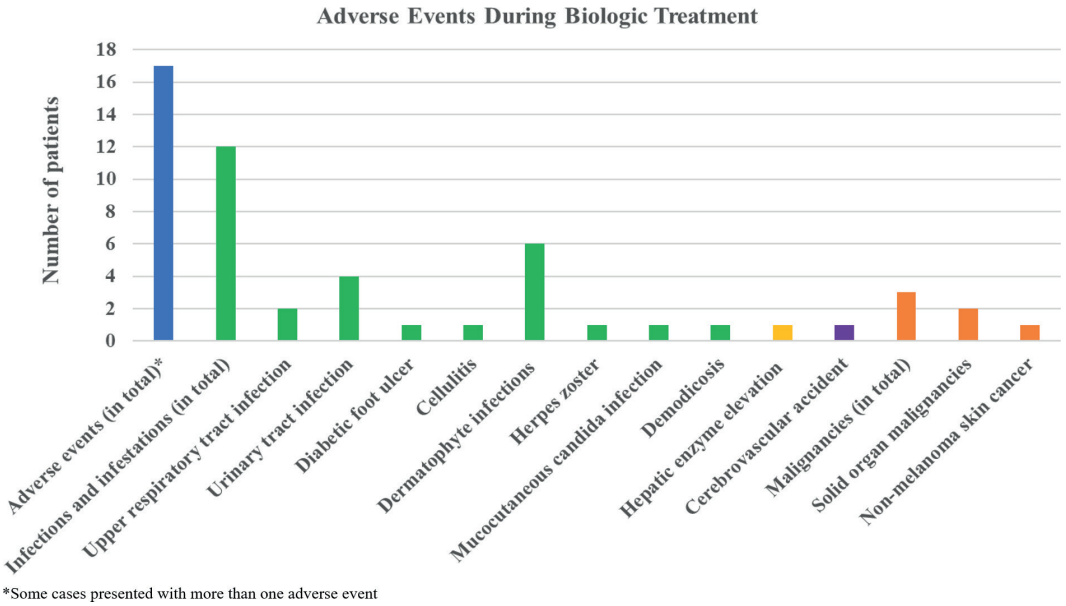

Figure 1. Adverse events recorded during biological treatment. Some cases presented with more than one adverse event.

(61.5%), adalimumab (13.3%), infliximab (11.9%), efalizumab (10.4%), and ustekinumab (2.9%) as the preferred biologics [21]. However, a 2019 multicenter study from the same country reported adalimumab (31.2%), ustekinumab (28.9%), etanercept (20.3%), and secukinumab (15%) as the most commonly used biologic options [18]. In our study, IL-23 and IL-17 inhibitors, namely guselkumab (30.2%), risankizumab (27.9%), and ixekizumab (25.6%), emerged as the most frequently prescribed treatments, while anti-TNF drugs were preferred in less than 10% of patients. This finding indicates that treatment preferences for geriatric psoriasis patients are shifting as new therapeutic options become available.

Our study population shares some similarities with other studies but differs notably in certain aspects. Consistent with previous studies on biologics in elderly patients, our study identified cardiometabolic comorbidities as the most common [12-14,16,17]. While cardiovascular comorbidities are known to be more prevalent in older adults, psoriasis itself is recognized as a risk factor for cardiovascular disease correlated with psoriasis severity [7,22]. The significant cardiometabolic comorbidity burden observed in our study may be related to the nearly 30-year disease duration and the severity of psoriasis that made these patients candidates for biological treatments.

Our study found a notably high LTBI prevalence of 65.1%, markedly higher than the 0.4% to 29.2% range reported in European and Japanese studies [12-14,16,18,23]. Although tuberculosis incidence has declined in Turkey, the country remains in the lower-moderate incidence category, and the older age of our patient group likely contributed to their higher exposure rates [24]. A study from Korea focusing on elderly patients treated with biologics reported a relatively similar LTBI prevalence of 51.1% among 90 patients [25]. Despite receiving prophylaxis, two of these patients developed active tuberculosis. In contrast, tuberculosis reactivation is rarely reported in other studies [23], but the limited number of LTBI cases in those cohorts makes interpretation challenging [12-14,16,18,23]. In our study, no tuberculosis reactivation was observed, which may be attributed to the strict implementation of tuberculosis prophylaxis and a low ratio of patients treated with TNF-alpha and IL-12/-23 inhibitors. However, one patient showed QuantiFERON-TB conversion during follow-up. Similarly, the Korean study also observed conversion in four additional patients [25]. These findings underscore the importance of close monitoring, particularly in regions with higher tuberculosis prevalence.

Similarly, serologic evidence of hepatitis B exposure was detected in 51.2% of our study population, a ratio higher than the 2.6–25.9% reported in other studies [12-14]. However, no case of reactivation was observed.

In our study, 39.5% of patients had adverse events, with infections and infestations (27.9%) being the most frequently encountered. However, treatment-ending adverse events were less common, occurring in 7% of cases. The data in the literature present conflicting results on whether advanced age increases the likelihood of adverse events during biological therapy. A post hoc analysis of three phase 3 secukinumab trials showed that severe adverse events (14.9% vs. 8.2%) and those possibly related to secukinumab (4.5% vs. 1.8%) were more frequent in older patients compared to younger ones [26]. Conversely, a post hoc analysis of two etanercept phase 3 trials reported a significant increase in serious adverse events in the elderly group, but these events were not directly linked to treatment [27].

An overview of real-world studies on biological treatment in elderly psoriasis patients is presented in Table S1. A study from Greece involving 154 elderly patients with an average follow-up of 48 months reported adverse events in 19.5% of patients, with treatment discontinuation due to severe adverse reactions occurring in 10.4% of cases [12]. Another study evaluating interleukin-23 inhibitors in elderly psoriasis patients found potential adverse events in 29.4%; however, no serious adverse event was recorded [16]. A study from the United States comparing biological treatment in patients over and under 65 did not find statistically significant differences in the frequency of adverse events or infections [28]. In contrast, a large multicenter study from Japan reported a higher incidence of treatment-ending adverse events in older patients [19]. While infections were more common in the elderly, the difference was not statistically significant. Malignancies were also observed more frequently in older patients compared to younger ones (P=0.0169). In our study, malignancy developed in three patients (7.0%) over a mean follow-up period of 117 weeks. In contrast, a multicenter study involving 266 elderly psoriasis patients on biologics for nearly four years found a lower overall rate of adverse events (9.4%), with no serious infection and a malignancy rate of 1.5%, significantly lower than in our study [18].

Treatment adherence is a common challenge across all medical fields, particularly in managing chronic diseases. Systemic psoriasis treatments have been shown to have higher adherence rates than topicals [29,30]. Additionally, a study comparing biological treatments with other modalities reported a 100% adherence rate for biologics, which was significantly higher than other systemic and topical treatments [31]. In older adults, multiple factors specific to this population may negatively impact adherence. A high burden of comorbidities and consequent polypharmacy, declines in cognitive and self-care abilities, sensory impairments such as vision and hearing loss, and physical limitations might reduce adherence [8]. Biologics may offer an advantage in terms of compliance, as they require less frequent hospital

visits and dosing and can often be self-administered. However, no study focused on the adherence of elderly patients to biological treatments. In our series, treatment was interrupted in 20.9% of cases due to various reasons, patient noncompliance (11.6%), transportation difficulties (7.0%), and comorbidities (4.7%) being the most common. Additionally, 20.9% of the patients required assistance from their younger relatives for hospital visits, and 44.2% needed help with administering their biologic drug. In contrast, ter Haar et al. reported significantly lower rates, at 9.9% and 4%, respectively [9]. Improving healthcare services for elderly by reducing their dependence on caregivers and facilitating access to treatment may increase treatment adherence in this population.

Our study had several limitations, including its retrospective design, a limited sample size, and the absence of a control group comprising younger psoriasis patients. Nevertheless, unlike other studies focusing on the efficacy and safety of biologics in elderly patients, our study provides a unique perspective by addressing additional challenges encountered during the treatment process. These challenges include patients' adherence to treatment, their ability to access healthcare services, and their need for assistance during the treatment process.

Conclusion

In conclusion, consistent with previous studies, biologics appear to be an effective treatment option in elderly patients. Although adverse events were observed in more than one third of the patients, most did not require treatment discontinuation. A diagnosis of malignancy was made in 7% of the cases during biological treatment, which warrants age-appropriate malignancy screening for these patients. A significant number of patients required assistance with accessing healthcare facilities and administering their medication. Factors such as noncompliance, comorbid health conditions, and transportation difficulties were identified as potential causes of treatment interruptions. More extensive multicenter studies are needed to evaluate safety, adherence, and factors negatively affecting long-term treatment maintenance in this population.

References

1. Parisi R, Iskandar IYK, Kontopantelis E, et al. National, regional, and worldwide epidemiology of psoriasis: systematic analysis and modelling study. *BMJ*. 2020;369:m1590. DOI:10.1136/bmj.m1590. PMID: 32467098
2. Armstrong AW, Mehta MD, Schupp CW, Gondo GC, Bell SJ, Griffiths CEM. Psoriasis Prevalence in Adults in the United States. *JAMA Dermatol*. 2021;157(8):940-946. DOI:10.1001/jamadermatol.2021.2007. PMID: 34190957
3. Damiani G, Bragazzi NL, Karimkhani Aksut C, et al. The Global, Regional, and National Burden of Psoriasis: Results and Insights From the Global Burden of Disease 2019 Study. *Front Med (Lausanne)*. 2021;8:743180. DOI:10.3389/fmed.2021.743180. PMID: 34977058
4. Liao YH, Chen KH, Tseng MP, Sun CC. Pattern of skin diseases in a geriatric patient group in Taiwan: a 7-year survey from the outpatient clinic of a university medical center. *Dermatology*. 2001;203(4):308-313. DOI:10.1159/000051778. PMID: 11752818
5. Sandhu VK, Ighani A, Fleming P, Lynde CW. Biologic Treatment in Elderly Patients With Psoriasis: A Systematic Review. *J Cutan Med Surg*. 2020;24(2):174-186. DOI:10.1177/1203475419897578. PMID: 31950853
6. Kostović K, Žužul K, Čeović R, Bukvić Mokos Z. Psoriasis in the mature patient: Therapeutic approach in the era of biologics. *Clin Dermatol*. 2018;36(2):222-230. DOI:10.1016/j.clindermatol.2017.10.013. PMID: 29566926
7. van Winden MEC, ter Haar ELM, Groenewoud HMM, van de Kerkhof PCM, de Jong EMGJ, Lubeek SFK. Disease and Treatment Characteristics in Geriatric Psoriasis: A Patient Survey Comparing Age Groups. *Acta Derm Venereol*. 2020;100(14):adv00215. DOI:10.2340/00015555-3569. PMID: 32556353
8. Bukvić Mokos Z, Jović A, Čeović R, Kostović K, Mokos I, Marinović B. Therapeutic challenges in the mature patient. *Clin Dermatol*. 2018;36(2):128-139. DOI:10.1016/j.clindermatol.2017.10.004. PMID: 29566917
9. Ter Haar ELM, van den Reek JMPA, Sadat Chenarani Moghadam M, et al. Frailty and functional dependency in a multicenter cohort of older adults with psoriasis: Prevalence and extent of and implications for psoriasis management. *J Am Acad Dermatol*. 2024;91(6):1289-1293. DOI:10.1016/j.jaad.2024.07.1527 PMID: 39245362
10. Liu Z, Liang Q, Ren Y, et al. Immunosenescence: molecular mechanisms and diseases. *Signal Transduct Target Ther*. 2023;8(1):200. DOI:10.1038/s41392-023-01451-2. PMID: 37179335
11. Garcia-Doval I, Carretero G, Vanaclocha F, et al. Risk of serious adverse events associated with biologic and nonbiologic psoriasis systemic therapy: patients ineligible vs eligible for randomized controlled trials. *Arch Dermatol*. 2012;148(4):463-470. DOI:10.1001/archdermatol.2011.2768. PMID: 22508869
12. Bakirtzi K, Sotiriou E, Papadimitriou I, et al. Elderly patients with psoriasis: long-term efficacy and safety of modern treatments. *J Dermatolog Treat*. 2022;33(3):1339-1342. DOI:10.1080/09546634.2020.1809623. PMID: 32783678
13. Momose M, Asahina A, Hayashi M, Yanaba K, Umezawa Y, Nakagawa H. Biologic treatments for elderly patients with psoriasis. *J Dermatol*. 2017;44(9):1020-1023. DOI:10.1111/1346-8138.13853. PMID: 28439956
14. Hayashi M, Umezawa Y, Fukuchi O, Ito T, Saeki H, Nakagawa H. Efficacy and safety of ustekinumab treatment in elderly patients with psoriasis. *J Dermatol*. 2014;41(11):974-980. DOI:10.1111/1346-8138.12653. PMID: 25346301
15. Medina C, Carretero G, Ferrandiz C, et al. Safety of classic and biologic systemic therapies for the treatment of psoriasis in elderly: an observational study from national BIOBADADERM registry. *J Eur Acad Dermatol Venereol*. 2015;29(5):858-864. DOI:10.1111/jdv.12688. PMID: 25185962

16. Ruggiero A, Fabbrocini G, Cinelli E, Ocampo Garza SS, Camela E, Megna M. Anti-interleukin-23 for psoriasis in elderly patients: guselkumab, risankizumab and tildrakizumab in real-world practice. *Clin Exp Dermatol*. 2022;47(3):561-567. DOI:10.1111/ced.14979. PMID: 34642965
17. Phan C, Beneton N, Delaunay J, et al. Effectiveness and Safety of Anti-interleukin-17 Therapies in Elderly Patients with Psoriasis. *Acta Derm Venereol*. 2020;100(18):adv00316. DOI:10.2340/00015555-3678. PMID: 33111960
18. Ricceri F, Bardazzi F, Chiricozzi A, et al. Elderly psoriatic patients under biological therapies: an Italian experience. *J Eur Acad Dermatol Venereol*. 2019;33(1):143-146. DOI:10.1111/jdv.15139. PMID: 29906311
19. Ohata C, Anezaki H, Yanase T, et al. Real-world safety and efficacy of biologics in elderly patients with psoriasis: A multicenter observational study. *J Dermatol*. 2024;51(12):1634-1640. DOI:10.1111/1346-8138.17385. PMID: 39031284
20. Smith CH, Anstey AV, Barker JN, et al. British Association of Dermatologists' guidelines for biologic interventions for psoriasis 2009. *Br J Dermatol*. 2009;161(5):987-1019. DOI:10.1111/j.1365-2133.2009.09505.x. PMID: 19857207
21. Piaserico S, Conti A, Lo Console F, et al. Efficacy and safety of systemic treatments for psoriasis in elderly patients. *Acta Derm Venereol*. 2014;94(3):293-297. DOI:10.2340/00015555-1719. PMID: 24158307
22. Yeung H, Takeshita J, Mehta NN, et al. Psoriasis severity and the prevalence of major medical comorbidity: a population-based study. *JAMA Dermatol*. 2013;149(10):1173-1179. DOI:10.1001/jamadermatol.2013.5015. PMID: 23925466
23. Chiricozzi A, Pavlidis A, Dattola A, et al. Efficacy and safety of infliximab in psoriatic patients over the age of 65. *Expert Opin Drug Saf*. 2016;15(11):1459-1462. DOI:10.1080/14740338.2016.1226279. PMID: 27534970
24. Naci Emecen A, Kıran P, Çağlayan D. Influential Factors of Tuberculosis Notification Rates in Turkey: A Provincial-Level Spatial Analysis. *Thorac Res Pract*. 2024;25(2):68-74. DOI:10.5152/ThoracResPract.2024.23109. PMID: 38454202
25. Koo T, Baek G, Jue MS. Risk of tuberculosis infection and serial changes in interferon-gamma release assays in elderly patients with psoriasis receiving biologic therapy. *J Dermatol*. 2022;49(9):887-894. DOI:10.1111/1346-8138.16471. PMID: 35619545
26. Körber A, Papavassilis C, Bhosekar V, Reinhardt M. Efficacy and Safety of Secukinumab in Elderly Subjects with Moderate to Severe Plaque Psoriasis: A Pooled Analysis of Phase III Studies. *Drugs Aging*. 2018;35(2):135-144. DOI:10.1007/s40266-018-0520-z. PMID: 29404966
27. Militello G, Xia A, Stevens SR, Van Voorhees AS. Etanercept for the treatment of psoriasis in the elderly. *J Am Acad Dermatol*. 2006;55(3):517-519. DOI:10.1016/j.jaad.2006.02.010. PMID: 16908365
28. Garber C, Plotnikova N, Au SC, Sorensen EP, Gottlieb A. Biologic and Conventional Systemic Therapies Show Similar Safety and Efficacy in Elderly and Adult Patients With Moderate to Severe Psoriasis. *J Drugs Dermatol*. 2015;14(8):846-852. PMID: 26267729.
29. VanDeKerkhofPC,DeHoopD,DeKorteJ,CobelensSA,KuipersMV. Patient compliance and disease management in the treatment of psoriasis in the Netherlands. *Dermatology*. 2000;200(4):292-8. DOI: 10.1159/000018390. PMID: 10894958
30. Zaghloul SS, Goodfield MJ. Objective assessment of compliance with psoriasis treatment. *Arch Dermatol*. 2004;140(4):408-14. DOI: 10.1001/archderm.140.4.408. PMID: 15096368
31. Chan SA, Hussain F, Lawson LG, et al. Factors affecting adherence to treatment of psoriasis: comparing biologic therapy to other modalities. *J Dermatolog Treat*. 2013;24(1):64-9. DOI: 10.3109/09546634.2011.607425. PMID: 21797808