doi: 10.53446/actamednicomedia.1554862

Acta Medica Nicomedia

Cilt: 8 Sayı: 1 Şubat 2025 / Vol: 8 Issue: 1 February 2025
https://dergipark.org.tr/tr/pub/actamednicomedia

Research Article | Araştırma Makalesi

GLOBAL RESEARCH TRENDS ON TNF-ALPHA POLYMORPHISMS IN PSORIASIS DISEASE'S BETWEEN 1975 AND 2024

1975 ILE 2024 ARASINDA PSORIASIS HASTALIĞINDA TNF-ALFA POLIMORFIZMLERI ÜZERINE GLOBAL ARAŞTIRMA TRENDLERI

Yasemin ADALI[1,2], Veli Kaan AYDIN[1], Yasemin BERBEROĞLU[1,*], Aylin KÖSELER[1]

[1]Pamukkale University Faculty of Medicine, Department of Biophysics, Denizli, Turkiye. [2]Queen's University Belfast, Centre for Public Health, Faculty of Medicine, Dentistry and Biomedical Sciences, Belfast, United Kingdom (Visiting Researcher)

ABSTRACT

Objective: The immune system is the source of the inflammatory, persistent skin condition known as psoriasis. Despite recent major advancements in the pathology of psoriasis, no bibliometric investigation associating TNF-Alpha polymorphisms to psoriasis has been conducted. The objective of this study was to better understand the development trend and boundaries of the area by using bibliometrics to assess the focal point and research overview of TNF-Alpha Polymorphisms and Psoriasis.

Methods: The Web of Science database was searched on March 26, 2024, with the terms "resilienc*" in the title and "tumo$r necrosis factor* or TNF or tumo$r necrosis factor*" and "polymorphism* or variant* or variation* or SNP*" and "psoriasis OR psoriatic*" in the topic. There were 400 documents in *Web of Science Core Collection* and all documents extracted without time frame restrictions. Visualizations created by web-r.org were made using web-based R analytics developed with bibliometric analysis.

Results: Since 2012, research on the relationship between psoriasis and TNF-Alpha polymorphisms has increased significantly. The research that received the most attention was published in Dermatology and the British Journal, with Nair RP receiving the most citations. China, the United States, and Italy were the most productive nations. "Association," "Rheumatoid Arthritis," and "Susceptibility" appeared most frequently in the KeyWordPlus analysis.

Conclusion: Future researchers may find the results of this study useful in their work, and it may present new avenues for investigating TNF-alpha polymorphisms and psoriasis.

Keywords: TNF-alpha polymorphism, psoriasis, bibliometric analysis, biblioshiny, R study

ÖZ

Amaç: Bağışıklık sistemi, sedef hastalığı olarak bilinen iltihaplı, kalıcı cilt rahatsızlığının kaynağıdır. Sedef hastalığının patolojisinde son zamanlardaki önemli gelişmelere rağmen, TNF-Alfa polimorfizmlerini sedef hastalığıyla ilişkilendiren hiçbir bibliyometrik araştırma yürütülmemiştir. Bu çalışmanın amacı, TNF-Alfa Polimorfizmleri ve Psoriasis'in odak noktasını ve araştırma genel bakışını değerlendirmek için bibliyometrik kullanarak alanın gelişim eğilimini ve sınırlarını daha iyi anlamaktır.

Yöntem: Web of Science veritabanı 26 Mart 2024'te, başlıkta "resilienc*" terimleri ve konu başlığında "tumor necrosis factor* or TNF or tumo$r necrosis factor*" ve "polymorphism* or variant* or vary* or SNP*" ve "psoriasis OR psoriatic*" terimleriyle arandı. Web of Science Core Collection'da 400 belge vardı ve tüm belgeler zaman çerçevesi kısıtlaması olmadan çıkarıldı. Web-r.org tarafından oluşturulan görselleştirmeler bibliyometrik analiziyle geliştirilen web tabanlı R analizi ile yapıldı.

Bulgular: 2012'den bu yana, sedef hastalığı ve TNF-Alfa polimorfizmleri arasındaki ilişki üzerine yapılan araştırmalar önemli ölçüde arttı. En fazla ilgi gören araştırma Dermatology ve British Journal'da yayınlandı ve Nair RP en fazla atıfı aldı. En üretken ülkeler Çin, Amerika Birleşik Devletleri ve İtalya oldu. "Association", "Romatoid Arthritis" ve "Susceptibility" KeyWordPlus analizinde en sık görülen ifadelerdir.

Sonuç: Gelecekteki araştırmacılar bu çalışmanın sonuçlarını çalışmalarında faydalı bulabilir ve TNF-alfa polimorfizmleri ve sedef hastalığını araştırmak için yeni yollar sunabilir.

Anahtar Kelimeler: : TNF-alfa polimorfizmi, sedef hastalığı, bibliyometrik analiz, biblioshiny, R study

***Corresponding author/İletişim kurulacak yazar:** Yasemin BERBEROĞLU; Pamukkale University Faculty of Medicine, Department of Biophysics, Denizli, Turkiye.
Phone/Telefon: +90 (505) 013 37 73 **e-mail/e-posta:** yasemins@pau.edu.tr
Submitted/Başvuru: 24.09.2024 • **Accepted/Kabul:** 27.02.2025 • **Published Online/Online Yayın:** 28.02.2025

Introduction

Psoriasis is a chronic, recurrent inflammatory skin condition. It is characterized by the development of red, scaly skin lesions as a result of hyper-proliferation of epidermal keratinocytes, which has a significant negative impact on the quality of life of patients.[1] Tumor necrosis factor-Alpha (TNF-α) is a key proinflammatory cytokine that promotes inflammatory pathways that exacerbate hallmark symptoms of psoriasis, such as redness and lesions. TNF-α triggers proinflammatory response and apoptosis by binding to TNF receptor 1 (TNFR1) and anti-inflammatory and cell survival pathways by binding to TNF receptor 2 (TNFR2). Overproduction of TNF-α plays a key role in the pathogenesis of autoimmune diseases such as psoriasis.[2] Also, TNF-α inhibitors are first-generation biologics that have been used for many years and are used to evaluate drug efficacy in psoriasis clinical trials.[3] Previous preclinical studies have demonstrated a considerable elevation of serum TNF-α levels in psoriasis patients.[4] Thus, functional TNF-α polymorphisms may impact an individual's susceptibility to psoriasis in addition to potentially influencing TNF-α's normal biological function.[4] The impact of polymorphisms in genes related to the disease's pathogenic environment, metabolism, or mechanism of action on the effectiveness of these medications has been evaluated via precision medicine research.[5]

British intelligence scientist Alan Pritchard initially suggested bibliometrics in 1969.[6] A common research method that makes use of quantitative tools to evaluate the impact of research and analyze vast amounts of scientific data is bibliometric analysis. It can be useful in attempting to comprehend scholarly and intellectual trends and provide insight into newly emerging fields.[7]

As a result of increased publication volume and the accessibility of computer analysis software, bibliometrics research efficiency and accuracy have recently increased. Because software visualization makes the results easier to understand, bibliometrics is a popular research method that has been widely used in the medical field.

The relationship between TNF-α Polymorphisms and Psoriasis has not been well studied bibliometrically. The aim of the study was to identify significant contributions and current research status, as well as to anticipate future development prospects and research trends on TNF-α Polymorphisms and Psoriasis.

Methods

Ethics statement

This study does not involve human participants, and hence, ethical approval was not required.

Study design

Bibliometric analysis is being used in this descriptive study.

Search strategy

The data collected from the Web of Science Core Collection (WoSCC) and advance search was conducted using keywords: “tumor necrosis factor* or TNF or tumor necrosis factor*” and “polymorphism* or variant* or variation* or SNP*” and “psoriasis OR psoriatic*”, Later, the results were refined in the WOS database according to index for Science Citation Index Expanded and Emerging Sources Citation Index publication type which are original articles only. The search was set to include articles published between 1975 to 2024. As a result of these inclusion criteria, 400 documents were presented in total without any timeframe restriction, language or WoSCC category limitation. All bibliographic data were exported from the WoS database and interpreted using analytical bibliometric methods.

Data analysis

A summary of the data analysis results was provided, along with visualizations. The open-source R package Bibliometrix was used to perform bibliometric analyses. Data matrices for publication trends, journal rankings, authorship analysis, the most productive countries, author collaboration patterns, Trend Topics, KeyWords Plus analysis, and the most cited articles were created using bibliometrix (biblioshiny).[6] Additionally, the publication was subjected to a quantitative analysis using Microsoft Office Excel 2019.

Results

An overview of the bibliographic data

Table 1 summarizes the statistics from the bibliography. Across 400 documents, it is observed that there are 30.36 citations on average per document, and 2.65 citations annually. This suggests the impact and well-citation of the literature on this subject are noteworthy. Additionally, international co-authorship appears in 18.75% of the studies.

Table 1. Summary of bibliographic statistics related with psoriasis and TNF-α polymorphisms (n=400)

Description	Results
Main information about data	
Timespan	1993-2024
Sources (Journals. Books. etc.)	195
Number of documents	400
Annual growth rate (%)	4.57
Document average age	9.35
Average citations per doc	30.36
Average citation per year	2.65
References	11251
Document contents	
Keywords plus term	1109
Author's keywords	858
Authors	
Number of authors	2525
Number of authors of single-authored docs	2
Authors collaboration	
Number of single-authored docs	2
Co-Authors per Doc	7.64
International co-authorships (%)	18.75
Document types	
Article	397
Article; early access	2
Article; proceedings paper	1

Annual scientific production

The annual scientific output of psoriasis and TNF-α polymorphisms published papers included in the WoSCC database from 1993 to 2024 is shown in Table 2. Since 1993, the number of scientific studies on resilience produced annually has been in the single digits until 2006. Between 2012 and 2023, over 20 relevant papers were published, indicating a step increase in the annual production of scientific research since 2012. In 2021 (n = 29) and 2023 (n = 29), the greatest number published in a single year happened.

While the total number of citations has generally increased over time, a significant peak occurred in 2009 and then a decline was observed. This suggests that while research activity in the field has increased, the average impact of individual studies may have decreased. (Table 2 and Figure 1)

Table 2. Annual scientific output associated with psoriasis and TNF-α polymorphisms and average number of article citations per year (n=400)

Year	Number of articles	Total citations	Mean total citations per article	Mean total citations per year	Citable years	Citable years
1993	2	101	50.5	1.58	32	32
1997	2	222	111	3.96	28	28
1998	1	36	36	1.33	27	27
1999	3	159	53	2.04	26	26
2000	4	253	63.25	2.53	25	25
2001	6	372	62	2.58	24	24
2002	7	360.99	51.57	2.24	23	23
2003	9	383.04	42.56	1.93	22	22
2004	1	17	17	0.81	21	21
2005	2	166	83	4.15	20	20
2006	10	324	32.4	1.71	19	19
2007	12	602.04	50.17	2.79	18	18
2008	8	1088.96	136.12	8.01	17	17
2009	12	1614	134.5	8.41	16	16
2010	15	583.95	38.93	2.6	15	15
2011	10	347	34.7	2.48	14	14
2012	26	1464.06	56.31	4.33	13	13
2013	25	920	36.8	3.07	12	12
2014	19	365.94	19.26	1.75	11	11
2015	24	649.92	27.08	2.71	10	10
2016	27	467.1	17.3	1.92	9	9
2017	24	378.96	15.79	1.97	8	8
2018	23	359.95	15.65	2.24	7	7
2019	23	255.07	11.09	1.85	6	6
2020	15	163.05	10.87	2.17	5	5
2021	29	267.09	9.21	2.3	4	4
2022	24	184.08	7.67	2.56	3	3
2023	29	38.86	1.34	0.67	2	2
2024	8	2	0.25	0.25	1	1

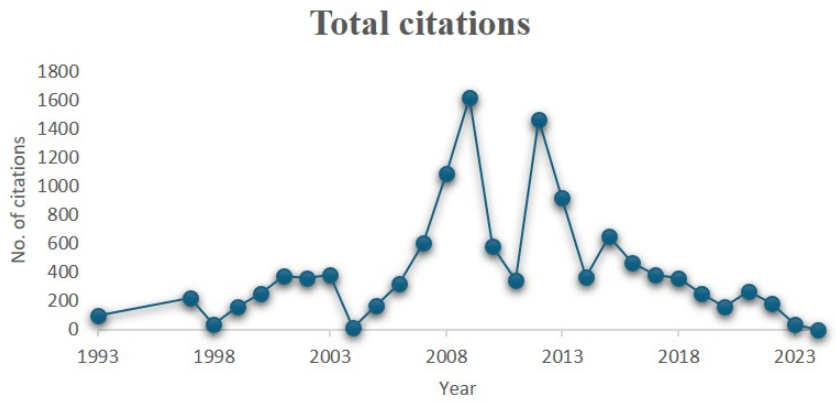

Figure 1. Yearly, average article citations associated with psoriasis and TNF-α polymorphisms.

Active journals

This study's 400 documents came from 195 different sources. Figure 2 displays the top 20 journals. In order, the most relevant journals were Journal of Rheumatology, Journal of The European Academy of Dermatology and Venereology, Journal of Investigative Dermatology, Plos One and British Journal of Dermatology.

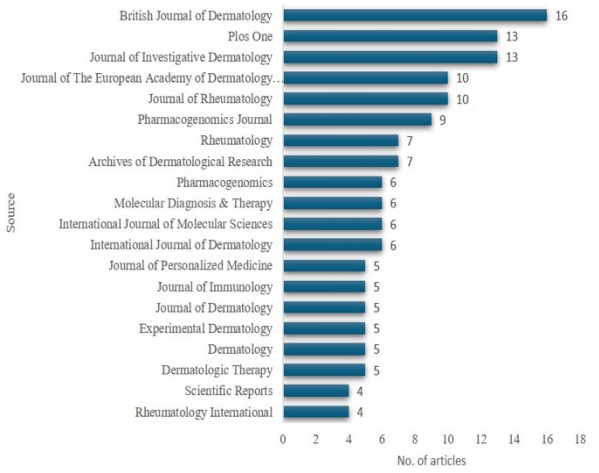

Figure 2. Most relevant sources associated with psoriasis and TNF-α polymorphisms.

In 1997, the Journal of Investigative Dermatology published the first research on patient and nursing resilience, and it continued to publish the most until 2012. Following the publication of a few relevant studies in the British Journal of Dermatology in 2001, it appears this journal has currently published a greater number of articles compared to Plos One (Figure 3).

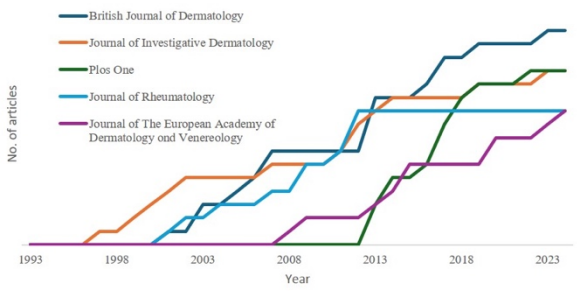

Figure 3. Article source growth plot of documents related with psoriasis and TNF-α polymorphisms.

Authorship analysis

Two authors of single-authored studies were among the 2957 authors who contributed in total to the retrieved documents. Each author contributed a total of 9.5 documents to the co-authored publication. Figure 4 lists the ten most productive writers. Out of all 2957 authors, four or more documents were produced by each of the top 10 authors.

The most productive author was Dauden E. from Instituto de Investigación Sanitaria La Princesa, with fourteen articles (3.5%) out of 400. Dauden E. conducted the most research in 2022 and started publishing relevant studies in 2012. Reich K., Rahman P., and Abad-Santos F. were the following most productive researchers. Of all these prominent writers, they started their research the earliest in 2012 and kept up a steady pace until 2022. Each of the remaining top 10 list authors authored four articles.

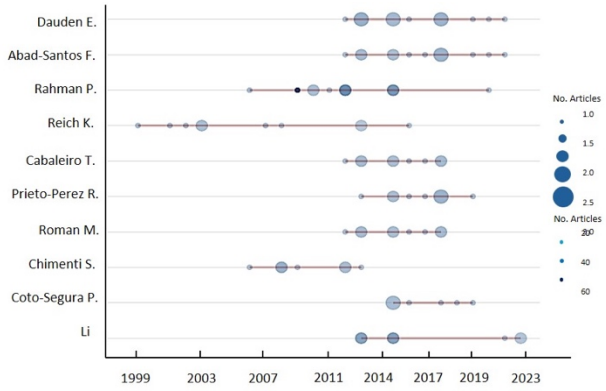

Figure 4. Top 10 authors and their production annually.

Italy, China, the USA, Spain, and Germany were the top five countries that generated the highest number of publications on TNF-α polymorphism and psoriasis, with 56, 55, 41, 36, and 29 articles respectively (Figure 5). Within the total of 400 documents, the United States represented 14% (56 out of 400). Collectively, the first five countries accounted for 54.25% of all published articles out of 400 countries, which is equivalent to 217 out of 400.

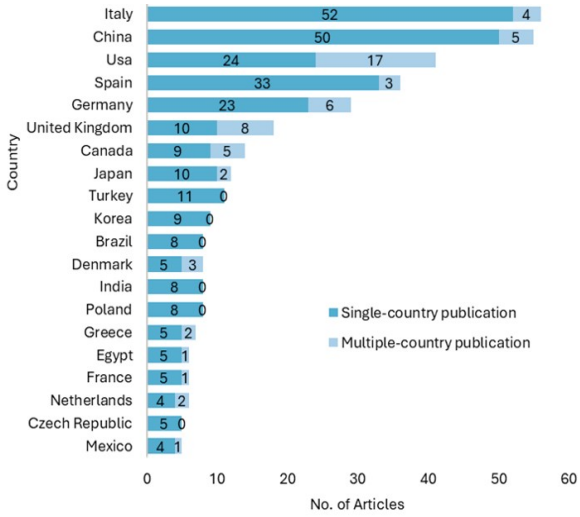

Figure 5. Most productive countries worldwide

KeyWords Plus analysis

1108 KeyWords Plus terms were used in the KeyWords Plus analysis. In Figure 6, the top 20 most frequently occurring KeyWords Plus terms are displayed as an overlay visualization map. The terms "polymorphisms" (n=53), "association" (n=95), "disease" (n=60), "susceptibility" (n=75), and "rheumatoid arthritis" (n=84) were the most encountered.

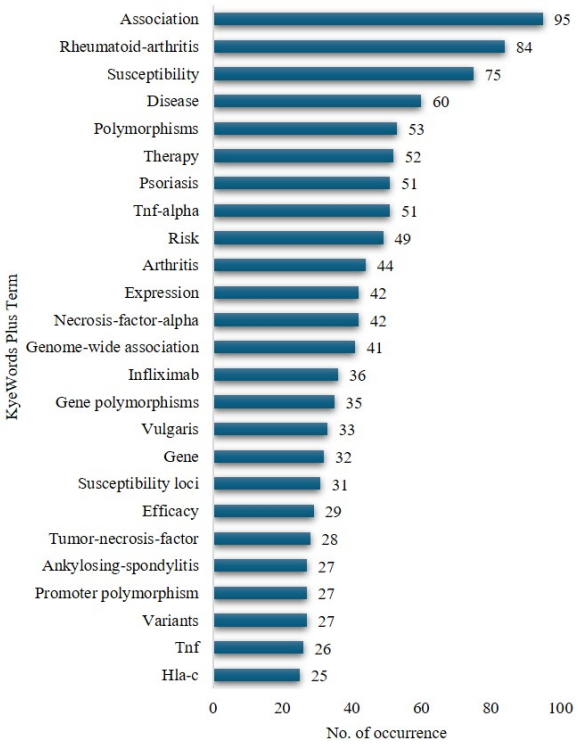

Figure 6. KeyWords Plus analysis of psoriasis and TNF-α polymorphisms

Trend in topics

The terms "predictor," "recommendation," "mice," and "differentiation" were trending in 2023, whereas the terms "predict response," "gene polymorphisms," "psoriatic arthritis," "pathogenesis," and "risk" were popular in 2019. The trend topics for 2016 included "association," "therapy," and "infliximab." The year with the highest term frequency over the whole period was 2016. Finding the relationships between different terms requires more than just using keyword frequencies. Figure 7 displays topic trends by year.

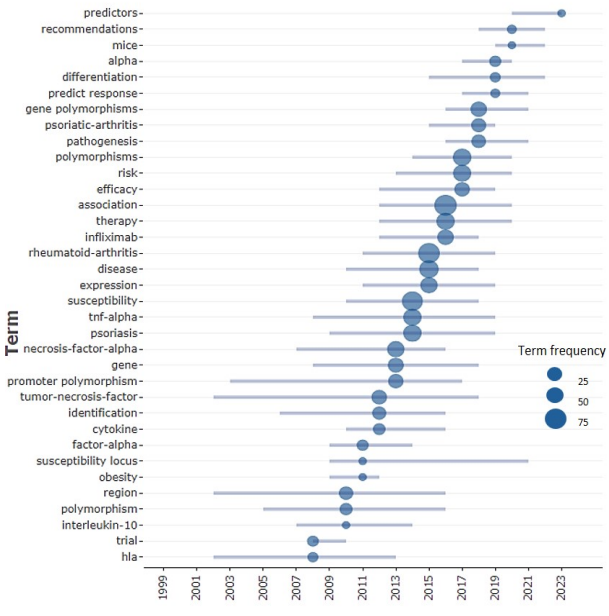

Figure 7. Trends in topic of psoriasis and TNF-α polymorphisms

In the KeyWords Plus Co-occurrence network, each Keywords Plus term is shown as a node, and each instance of a word pair is included as a link. The weight allocated to a pair of terms in a link between these two KeyWords Plus terms is based on their co-occurrence frequency in numerical articles. Through this process, a weighted network is generated. Each weight is denoted by the number of links, and the weights are proportionally indicated by the thickness of the links.

Figure 8 illustrates the KeyWords Plus terms associated with each of the three clusters. Regarding TNF-α polymorphisms and psoriasis, the terms "association," "psoriasis," "polymorphisms," and "genome-wide association" seemed to be most frequently used. The second-largest concept in the cluster with "rheumatoid arthritis" as its central term was "therapy".

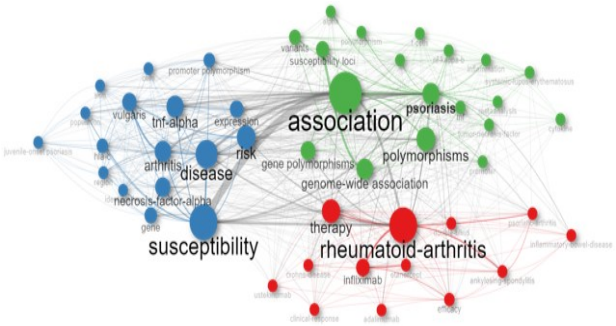

Figure 8. KeyWords Plus co-occurrence network analysis of psoriasis and TNF-α polymorphisms

Most globally cited documents

Table 3 displays the top ten documents that have been cited worldwide. The most frequently cited article was written by Nair et al. and published in Nature Genetics in 2009 under the title "Genome-wide scan reveals association of psoriasis with IL-23 and NF-κB pathways.".[8] This article was cited 1080 times. "Genome-wide association analysis of psoriatic arthritis and cutaneous psoriasis reveals differences in their genetic architecture" is the title of Stuart et al.'s most recent publication from 2015.[9] From its online publication in December 2020 until the search date of this manuscript, it received 207 citations, establishing it as the study with the greatest citation count within a short timeframe.

Discussion

This paper presents the initial bibliometric analysis that specifically examines TNF-α polymorphisms and psoriasis. It offers a comprehensive analysis of the intellectual framework and scientific direction within this field. R-based Biblioshiny web-programme has enabled the visualization of knowledge graphs and the identification of significant authors, organizations, and research clusters.

The present study investigated the scientific advancements and developing trends in the distribution of articles on TNF-α polymorphisms and psoriasis.

Table 3. Most globally cited articles

Rank	Bibliographic information	No. of total citation
1	Nair RP, Duffin KC, Helms C, Ding J, Stuart PE, Goldgar D, Gudjonsson JE, Li Y, Tejasvi T, Feng BJ, Ruether A. Genome-wide scan reveals association of psoriasis with IL-23 and NF-κB pathways. Nature genetics. 2009;41(2):199-204. https://doi.org/10.1038/ng.311	1080
2	Liu Y, Helms C, Liao W, Zaba LC, Duan S, Gardner J, Wise C, Miner A, Malloy MJ, Pullinger CR, Kane JP. A genome-wide association study of psoriasis and psoriatic arthritis identifies new disease loci. PLoS genetics. 2008;4(4):e1000041. https://doi.org/10.1371/journal.pgen.1000041	535
3	Gregory AP, Dendrou CA, Attfield KE, Haghikia A, Xifara DK, Butter F, Poschmann G, Kaur G, Lambert L, Leach OA, Prömel S. TNF receptor 1 genetic risk mirrors outcome of anti-TNF therapy in multiple sclerosis. Nature. 2012;488(7412):508-11. https://doi.org/10.1038/nature11307	276
4	Jordan CT, Cao L, Roberson ED, Duan S, Helms CA, Nair RP, Duffin KC, Stuart PE, Goldgar D, Hayashi G, Olfson EH. Rare and common variants in CARD14, encoding an epidermal regulator of NF-kappaB, in psoriasis. The American Journal of Human Genetics. 2012;90(5):796-808. https://doi.org/10.1016/j.ajhg.2012.03.013	271
5	Boisson B, Wang C, Pedergnana V, Wu L, Cypowyj S, Rybojad M, Belkadi A, Picard C, Abel L, Fieschi C, Puel A. An ACT1 mutation selectively abolishes interleukin-17 responses in humans with chronic mucocutaneous candidiasis. Immunity. 2013;39(4):676-86. https://doi.org/10.1016/j.immuni.2013.09.002	211
6	Stuart PE, Nair RP, Tsoi LC, Tejasvi T, Das S, Kang HM, Ellinghaus E, Chandran V, Callis-Duffin K, Ike R, Li Y. Genome-wide association analysis of psoriatic arthritis and cutaneous psoriasis reveals differences in their genetic architecture. The American Journal of Human Genetics. 2015;97(6):816-36. https://doi.org/10.1016/j.ajhg.2015.10.019	207
7	Kaluza W, Reuss E, Grossmann S, Hug R, Schopf RE, Galle PR, Maerker-Hermann E, Hoehler T. Different transcriptional activity and in vitro TNF-α production in psoriasis patients carrying the TNF-α 238A promoter polymorphism. Journal of Investigative Dermatology. 2000;114(6):1180-3. https://doi.org/10.1046/j.1523-1747.2000.00001.x	188
8	Naldi L, Addis A, Chimenti S, Giannetti A, Picardo M, Tomino C, Maccarone M, Chatenoud L, Bertuccio P, Caggese E, Cuscito R. Impact of body mass index and obesity on clinical response to systemic treatment for psoriasis: evidence from the Psocare project. Dermatology. 2008;217(4):365-73. https://doi.org/10.1159/000156599	171
9	Tonel G, Conrad C, Laggner U, Di Meglio P, Grys K, McClanahan TK, Blumenschein WM, Qin JZ, Xin H, Oldham E, Kastelein R. Cutting edge: a critical functional role for IL-23 in psoriasis. The Journal of Immunology. 2010;185(10):5688-91. https://doi.org/10.4049/jimmunol.1001538	170
10	Höhler T, Kruger A, Schneider PM, Schopf RE, Knop J, Rittner C, zum Büschenfelde KH, Märker-Hermann E. A TNF-α promoter polymorphism is associated with juvenile onset psoriasis and psoriatic arthritis. Journal of Investigative Dermatology. 1997;109(4):562-5. https://doi.org/10.1111/1523-1747.ep12337469	165

Recent years have seen a substantial increase in research investigating the association between psoriasis and TNF-α polymorphisms.

The bibliometric analysis of publications on psoriasis and TNF-α polymorphisms reveals a growing research community and an increase in scientific output since 2012. However, the decline in average citations suggests that while the field is active, the impact of individual studies may be decreasing. Further analysis is needed to understand the underlying reasons for this trend and to identify potential areas for future research.

In the analysis of current study showed that the most productive countries were Italy, Chine, and USA. However, another Bibliometric analyses of publications on biologics in psoriasis between 2004 and 2023 show active research, especially in China and the United States.[10] Also, Steven R. Feldman and organizations such as the University of Manchester are among the most prolific contributors in tfhis field. İn the current bibliometric analysis, the most related research was published in the British Journal ond Dermatlogy and Nair RP was the highest number of citation author.[10] The growth rate of published articles in the bibliometric analysis results, the continuous growth of dermatological research, particularly in the area of psoriasis and TNF-α polymorphisms, demonstrates the importance of this research area and its potential to contribute to improved patient outcomes.

The terms most often come across in the KeyWord Plus analysis were “association”, “rheumatoid arthritis” and “susceptibility”. Recent research trends have emphasized the role of TNF-α polymorphisms in the pathogenesis of psoriasis, highlighting their potential as genetic susceptibility factors in this autoimmune and inflammatory disease.

While bibliometric analysis is a useful scientific method for estimating the research status in a certain scientific subject, it is important to note that the publications reviewed in this analysis may not completely reflect the entire literature on resilience due to biases associated with databases and language. Notwithstanding, these results provide a comprehensive summary of current investigation trends on resilience in association to TNF-α polymorphisms and psoriasis.

In conclusion, over the past decade, there has been a substantial demand for research on TNF-α Polymorphisms and Psoriasis. This study is important for analyzing the overall research and publication patterns of studies pertaining to psoriasis. The potential relationship between TNF-α polymorphisms and psoriasis is highlighted by this bibliometric study, which will direct future research efforts in the search for more potent treatments.

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions

YA and AK: The main idea and hypothesis of the study, YA: theory development, YA and VKA: contributed to materials and methods, YA: data analysis, YA and YB:

manuscript writing, YA: preparation of the publication format.

Financial Support
None

References

1. Wang L, Zhou H. A Meta-Analysis of the Relationship between Tumor Necrosis Factor-α Polymorphisms and Psoriasis. *Dermatology.* 2021;237(1):39-45. doi:10.1159/000502255
2. Chokshi A, Demory Beckler M, Laloo A, Kesselman MM. Paradoxical Tumor Necrosis Factor-Alpha (TNF-α) Inhibitor-Induced Psoriasis: A Systematic Review of Pathogenesis, Clinical Presentation, and Treatment. *Cureus.* 2023;15(8):e42791. doi:10.7759/cureus.42791.
3. Rendon A, Schäkel K. Psoriasis pathogenesis and treatment. International journal of molecular sciences, 2019;20(6):1475.
4. Baliwag J, Barnes DH, Johnston A. Cytokines in psoriasis. *Cytokine.* 2015;73(2):342-350. doi:10.1016/j.cyto.2014.12.014
5. Jiménez CM, Ramírez CP, Martín AS, et al. Influence of genetic polymorphisms on response to biologics in moderate-to-severe psoriasis. *J Pers Med.* 2021;11(4). doi:10.3390/jpm11040293
6. Aria M, Cuccurullo C. bibliometrix: An R-tool for comprehensive science mapping analysis. *J Informetr.* 2017;11(4):959-975. doi:10.1016/j.joi.2017.08.007
7. Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res.* 2021;133:285-296. doi:10.1016/j.jbusres.2021.04.070
8. Nair RP, Duffin KC, Helms C, et al. Genome-wide scan reveals association of psoriasis with IL-23 and NF-κB pathways. *Nature Genetics.* 2009;41(2):199-204. doi:10.1038/ng.311
9. Stuart PE, Nair RP, Tsoi LC, et al. Genome-wide Association Analysis of Psoriatic Arthritis and Cutaneous Psoriasis Reveals Differences in Their Genetic Architecture. *Am J Hum Genet.* 2015;97(6):816-836. doi:10.1016/j.ajhg.2015.10.019
10. Wang Y, Li J, Guo C, Yang G, Lin H, Zhang Y. Bibliometric analysis and description of research trends in the treatment of psoriasis with biologic agents in the past two decades (2004–2023). *J Dermatol Treat.* 2024;35(1). doi:10.1080/09546634.2024.2346282