Analysis of Research on Psoriasis With Science Mapping Technique

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Introduction

Psoriasis is a skin disease that causes skin lesions covered with silvery scales. These lesions can usually appear on the elbows, knees, scalp, and back, but can also appear anywhere on the body. Most people have only minor lesions. In some cases, the lesions may be itchy or painful. Psoriasis affects about 3% of people. It can begin at any age, but most often it begins under the age of 35, and men and women are equally affected by the disease. The severity of the disease varies from person to person. In some cases, it affects the quality of life of patients very badly. Periods when symptoms are absent or mild in the disease and periods when symptoms are more severe follow each other. Psoriasis is an autoimmune disease. Positive family history is also a factor that increases the risk of developing psoriasis [1].

Bibliometrics is the analysis of the works produced by the determined people/institutions in the determined area, in the determined time, and the relations between these works. Scientific publications are increasing in quantity. With this increase, it has become difficult to follow and analyze scientific developments. Changes in different disciplines or their dynamics should be monitored by scientists. Those working in the academic field demand to stay up-to-date and access the data they need at any time. These demands and needs have triggered the use of bibliometric methods [2,3].

Bibliometrics is based on performing various analyzes on data obtained from databases. As a result of these analyzes, a panoramic view of the subject or discipline can be obtained. In this way, information can be obtained about scientists, works, and articles related to the subject or discipline, and information about their publication performances can be reached. The bibliometric analysis allows us to examine the literature extensively and to see the subject at one point. In addition, it gives information about the citation performances of the works. This information obtained is important in the evaluation of the scientific competence of the works. The aging rate of the literature can be calculated by citation analysis studies performed with bibliometric methods, and accordingly, the attitudes of libraries towards the relevant literature are decided [4,5].

One of the main uses of bibliometrics is scientific mapping. Scientific mapping is the analysis of relationships between different elements that make up scientific disciplines, such as universities, various works, and authors. Science Mapping can also be defined as the visualization of a science discipline [6].

There is much software used for scientific mapping. Gephi, UCINET, Pajek, CoPalRed, Cytoscape, CiteSpace II, VOSviewer are some of the software in question.

The aim of this study is to analyze the studies on psoriasis in the literature with the science mapping technique.

Methods

Article data obtained from the Web of Science (WoS) Core Collection database were used in the research. The search criteria for the subject in the database are listed below.

["psoriasis" (Topic) and 2021 (Exclude – Publication Years) and Articles (Document Types) and Dermatology (Web of Science Categories) and English (Languages) and Science Citation Index Expanded (SCI-EXPANDED) or Social Sciences Citation Index (SSCI) (Web of Science Index)].

As a result of the search made with these criteria, 13453 articles were found (https://apps.webofknowledge.com). The article data were downloaded in "plain text" format and analyzed in the SciMAT program. As a result of the examination, it was determined that 1517 articles related to the years 1945-1989 did not contain the data necessary for the analysis, and these articles were not included in the analysis. Before the analysis, the keywords used in the articles were grouped by considering singular/plural, synonymy, and abbreviation. The analysis of the data was carried out by dividing the periods 1990-1999, 2000-2009, and 2010-2020. There were 2154 articles in the first period, 3252 articles in the second period, and 6530 articles in the last period. The total number of articles included in the analysis is 11936. Analyzes were made in the SciMAT program using the following configurations.

- Unit of analysis: Words (author Role=true, source Role=true, added Role=true)

- Kind of network: Co-occurrence,

- Normalization measure: Equivalence index
- Cluster algorithm: Simple Centers
- Evolution measure: Inclusion index
- Overlapping measure: Inclusion index.

To see and evaluate the important themes related to psoriasis, the word group "Psoriasis", which constitutes a dominant motor theme, was excluded from the analysis. Analysis findings are presented with strategic diagrams, overlap maps, and thematic development map visuals.

The sizes of the themes in the strategic diagrams and thematic development map vary depending on the number of publications. The quality evaluations of the themes obtained were made by the number of publications, the total number of citations, and the h-index values. In strategic diagrams, themes take place according to centrality and intensity levels. Themes with strong external relations, that is, high centrality, are seen on the right side of the diagram, while themes with strong internal relations, that is, high density, are seen on the upper side.

- Motor themes with high centrality and intensity are located in the upper right area. These themes express high density and high centrality and are developed and required motor themes (Engine Themes). They are important for structuring a workspace. Keywords in the motor theme have strong internal links. This makes them more advanced as they commonly appear together. They are important for shaping the study topic and include well-developed themes.

- Developed and isolated themes with low centrality and high density are placed in the upper left area (Highly Developed and Isolated Theme). This theme expresses higher density and lower centrality. It is highly developed but isolated. Advanced and isolated themes are themes that are not developed enough. But it is important for the development of the study topic.
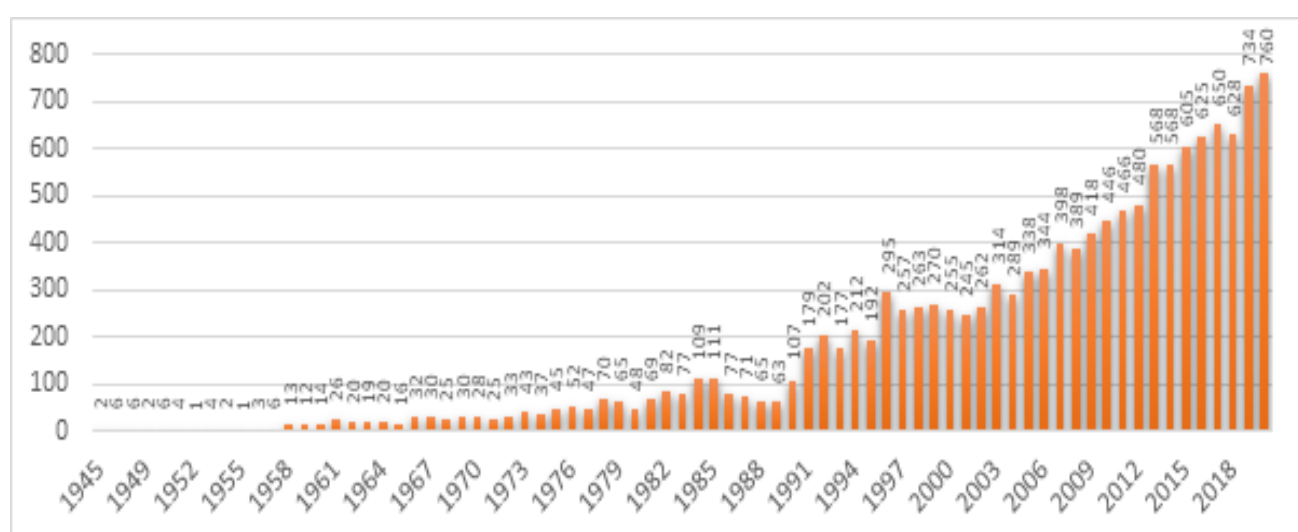
- Emerging or disappearing themes with low centrality and intensity are located in the lower-left area (Emerging or Declining Themes). These themes are emerging or declining themes. It includes themes with low centrality and low-density values. They are new themes that may emerge or go beyond the research field to become better. These themes are not only poorly developed but are of low importance to the AV study topic.

- Basic and transformational themes with high centrality and low intensity are located in the lower right area (Basic and Transversal Themes). They are low density, high centrality themes. A lot of research has been done on these core themes and they have well-developed interconnections. It is of vital importance to the subject of study. It is seen that the most repeated and most related words are included in this theme. Themes with a large number of articles are mainly located in this area, which is quite logical. Because the main and variable themes are the main focus of the study.

In the overlap map, the quantitative development of the keywords used in the articles by periods is explained. In the thematic development map, the relationships between the themes are shown and the thickness of the lines between the themes is shaped depending on the strength of the relationship. Solid lines indicate that the same keywords as the theme names are shared among the themes, while dashed lines indicate that common words are shared except for the theme names.

Findings

The distribution of the articles published on psoriasis by years is given in the graph in **Figure 1**. As seen in the graph, the first article was published in 1945. There has been an increase in the number of articles published since the 1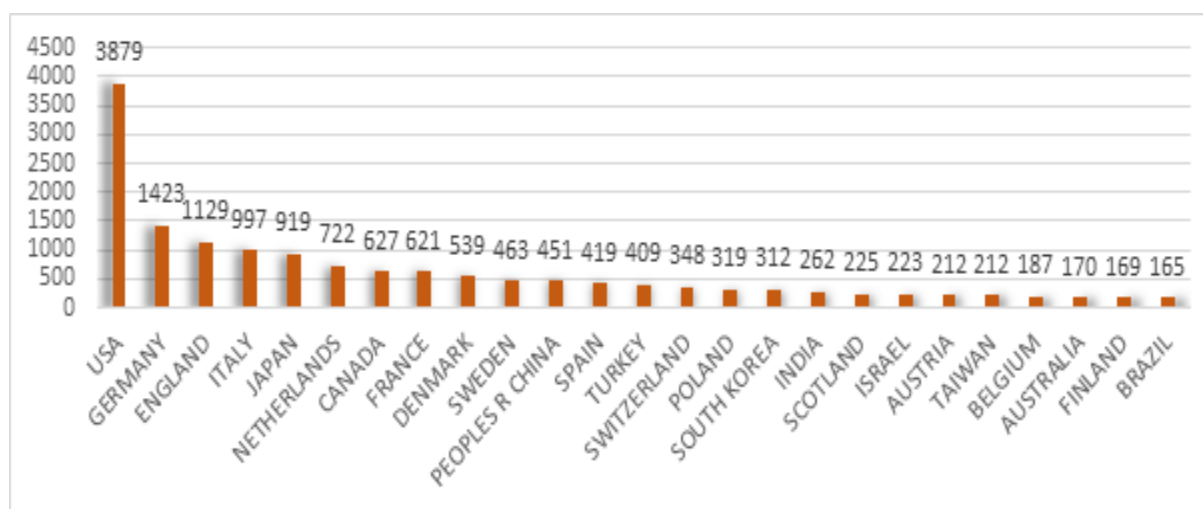960s. Although there was a significant decrease in the number of publications in the second half of the 1980s, it has been determined that there has been a continuously increasing trend since 1990.

Figure 1. Number of Publications by Years

The distribution of the articles on psoriasis according to the countries in which they were published is given in the graph in **Figure 2**. When the graph is examined, the USA ranks first with 3879 articles, followed by Germany with 1423 articles and England with 1129 articles. Turkey ranks thirteenth with 409 articles published.

Figure 2. Number of Publications by Country (Top 25 Countries)

Information on the five most cited articles is given in **Table 1**. According to this information, the first two articles received more than 2000 citations and the top 3 most cited articles were Finlay and Khan (1994), Fredrikson and Pettersson (1978), Rapp et al. (1999)

were found to be articles published by. Considering the duration of the article published by Proksch et al. in 2008, the high number of citations (n=1036) was considered as an important finding.

Table 1: Most Cited Publications

Rank	Article	Year	Total Citations
1	Finlay AY, Khan GK. Dermatology Life Quality Index (DLQI)--a simple practical measure for routine clinical use. Clin Exp Dermatol. 1994 May;19(3):210-6.	1994	2907
2	Fredriksson T, Pettersson U. Severe psoriasis--oral therapy with a new retinoid. Dermatologica. 1978;157(4):238-44.	1978	2076
3	Rapp SR, Feldman SR, Exum ML, Fleischer AB Jr, Reboussin DM. Psoriasis causes as much disability as other major medical diseases. J Am Acad Dermatol. 1999 Sep;41(3 Pt 1):401-7.	1999	1056
4	Proksch E, Brandner JM, Jensen JM. The skin: an indispensable barrier. Exp Dermatol. 2008 Dec;17(12):1063-72.	2008	926
5	Krueger G, Koo J, Lebwohl M, Menter A, Stern RS, Rolstad T. The impact of psoriasis on quality of life: results of a 1998 National Psoriasis Foundation patient-membership survey. Arch Dermatol. 2001 Mar;137(3):280-4.	2001	797

Table 2 contains information about the top five authors who have published the most articles. According to this information, three authors have published more than 200 articles. The authors who

published the most articles were Peter CM van de Kerkhof (n=217), Christopher EM Griffiths (n=215), and Steven R. Feldman (n=213).

Table 2: Most Prolific Writers

Rank	Name	Number of documents
	Peter CM van de Kerkhof	217
2	Christopher EM Griffiths	215
3	Steven R. Feldman	213
4	Kristian Reich	168
5	Alice Gottlieb	149

The findings regarding the most frequently used keywords in the articles included in the bibliometric analysis are given in **Table 3**. According to these findings, it was seen that the words "Psoriasis"

(n=5752), "Therapy" (n=1498), and "Skin" (n=1276) were the most used keywords.

Table 3: The Most Used Keywords in the Research

Rank	Word Group	Number of Times Used
1	Psoriasis	5752
2	Therapy	1498
3	Skin	1276
4	Disease	1142
5	Quality of life	1061

Strategic diagrams related to the themes obtained as a result of the analysis carried out are given in **Figure 3**.

- There were 13 themes (4 motor themes, 3 isolated and advanced themes, 3 basic and transformational themes, 3 emerging or disappearing themes) in the first period,

- 20 themes (5 motor themes, 6 isolated and advanced themes, 6 basic and transformational themes, 3 emerging or disappearing themes) in the second period,

- 26 themes (8 motor themes, 6 isolated and advanced themes, 6 basic and transformational themes, 6 emerging or disappearing themes) in the third period.

In the first period, 1990-1999, the theme with the highest number of articles published (n=189), the most cited (n=6368), and the highest h-index (46) was "Expression", which was among the basic and transformational themes of the period. The theme of "Expression" has kept its importance in the last period (number of publications: 484; a number of citations: 9920; h-index: 43) and found its place among the motor themes of the period.

In the second period, 2000-2 009, the motor theme, which has the most articles published (n=324), the most cited (n=12702), and the second-highest h-index (58), was the "Keratinocytes" theme.

The theme with the most articles published (n=660), the most cited (n=18324), and the highest h-index (67) in the 2010-2020 period is the "Double-blind" theme, which is the most prominent engine theme of the period. The "double-blind" theme was among the motor themes in the first period (number of publications: 53; number of citations: 2134; h-index: 29) and the second period (number of publications: 186; a number of citations: 8130; h-index: 47). It has emerged as an important argument used in articles on psoriasis.

In the first period, "Proliferation" (number of publications: 111; a number of citations: 3826; h-index: 39), "Photochemotherapy" (number of publications: 69; a number of citations: 2474; h-index: 25), and "Tumor necrosis factor" (number of publications: 41; a number of citations: 2359; h-index: 26) were among the motor themes of the period.

The theme of "Tumor necrosis factor" (number of publications: 18; a number of citations: 1015; h-index: 14) was among the isolated and developed themes in the second period, while the theme of "Necrosis factor alpha" (number of publications: 46; a number of citations: 2758); h-index: 30) and the third (number of publications: 26; a number of citations: 663; h-index: 14) are included in the diagram as one of the emerging or disappearing themes of the period.

Having the highest h-index value of the second period, the theme of "Quality of life" has been among the motor themes recently (number of publications: 358; a number of citations: 8246; h-index: 47). The theme of "Therapy", which received 9393 citations from 208 articles published in the second period and whose h-index value was 47, was among the basic and transformational themes of the period.

Recently, "Adalimumab" (number of publications: 443; number of citations: 10883; h-index: 50), "Metabolic syndrome" (number of publications: 286; number of citations: 7486; h-index: 44), "Management" (publication number: 342; number of citations: 8081; h-index: 45) were among the motor themes of the period.

The "T cells" theme (number of publications: 19; a number of citations: 955; h-index: 15), which was among the themes that emerged or disappeared in the first period, developed in the second period (number of publications: 99; a number of citations: 4276; h-index: 40) and in the third period (number of publications: 99; a number of citations: 3347; h-index: 32) were found to be among the main and transformational themes **(Table 4)**.

"Phototherapy" theme (number of publications: 81; a number of citations: 2586; h-index: 31), which is among the basic and transformational themes in the second period, and isolated and advanced themes (number of publications: 48; a number of citations: 740; h-index): 16).

Similarly, the "Calcipotriol" theme was among the main and transformational themes in the second period (number of publications: 56; number of citations: 1524; h-index: 22) and in the last period (number of publications: 38; a number of citations: 635; h-index: 15) they were among the isolated and advanced themes.
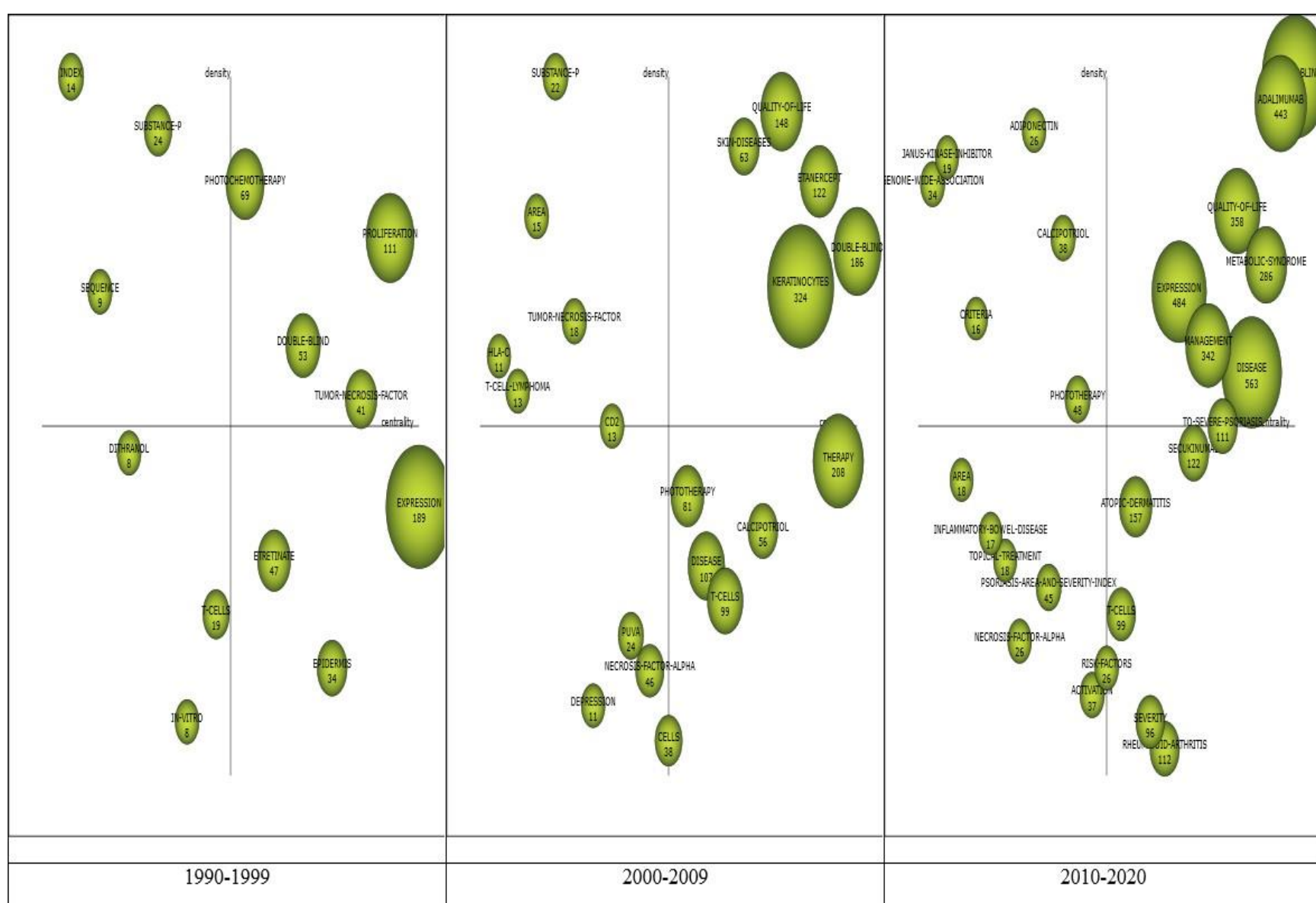
Table 4: Findings Related to Themes

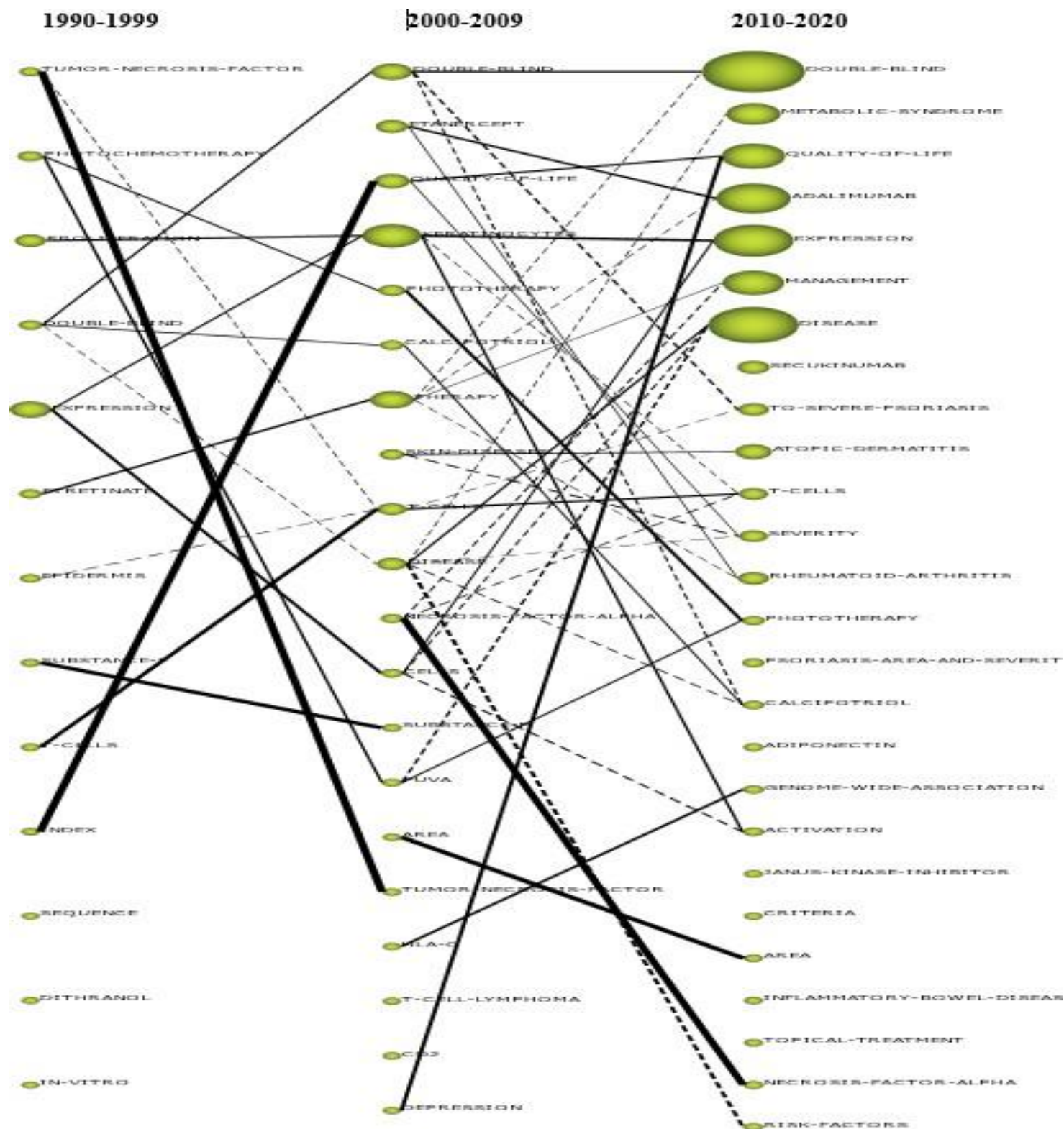| Name	Number of documents	Number of citations	h-Index	Centrality	Density
Period of 1990-1999					
Expression	189	6,368	46	18.7	5.03
Proliferation	111	3,826	39	17.66	9.08
Photochemotherapy	69	2,474	25	2.91	9.22
Double-blind	53	2,134	29	4.01	6.14
Tumor necrosis factor	41	2,359	26	9.86	5.54
Period of 2000-2009					
Keratinocytes	324	12,702	58	15.96	8.87
Quality of life	148	10,037	59	12.32	13.77
Etanercept	122	6,947	44	15.96	12.93
T cells	99	4,276	40	6.15	3.59
PUVA	24	958	14	3.25	2.31
Period of 2010-2020					
Double-blind	660	18,324	67	43.5	24.77
Expression	484	9,920	43	14.14	8.07
Adalimumab	443	10,883	50	30.72	14.81
Quality of life	358	8,246	47	17.44	11.2

According to the thematic development map findings in **Figure 4** and **Table 4**.

The theme of "Double-blind" is in a strong relationship in all periods, especially in the last two.

The "Etanercept" theme in the second period is related to the "Adalimumab" theme from the last period,

Figure 3. Strategic Diagram

Figure 4. Overlap and Thematic Development Map

Discussion

The theme of "Keratinocytes", which has the highest number of publications in the second period, is more powerful with the theme of "Proliferation" and "Expression" from the first period and with the theme of "Expression" from the last period but is related to the themes of "Activation". The "Expression" themes in the first and last period are in relation with the "Cells" theme from the second period,

The theme "Phototherapy", which is in the last two periods and shows a strong relation between them is correlated to "Photochemotherapy" from the first period. While the "Photochemotherapy" theme is related to the "PUVA" theme from the second period, the "PUVA" theme is related to the "Phototherapy" theme from the last period,

The "Necrosis factor alpha" theme, which took place in the last two periods and shows a strong relation between them, is also related to the "T cells" theme from the last period,

The "HLA C" theme in the second period is related to the "Genome-wide association" theme from the last period.

The first article on psoriasis was published in 1945, and it has been determined that there has been a continuously increasing trend in the number of published articles since the nineties. Psoriasis was described as the great dermatological mystery in the early 1920s. During this period, while some information about its symptomatology, diagnosis, and clinical course is available, little has been discovered about its treatment. Woronoff ring around the psoriatic plaque after treatment with Anthrarobin and spongy pustule lesion in pustular disease was described in this period. In the following years, there was no significant change in the information about the disease. The information obtained in the 20s and 30s with the studies carried out requires a process to be processed by scientists by entering the literature. For this reason, the publication date of the first article in the databases examined in our study is 1945, which is compatible with the historical development of the information about the disease [7,8].

The academic performances of the countries on Psoriasis have been examined and it has been seen that the USA, which is the leader in this field, is also the leader in this subject. This country is followed by countries such as Germany and England, and countries such as

Italy, the Netherlands, Canada, and Japan, which have a say in the academic field, also come to the fore in studies on Psoriasis. When all medical publications are taken into account, while the USA, China, England, and Germany rank first in the world, Turkey ranks 16th. However, when we look at the number of citations received by the publications of the countries, Turkey is even further behind. According to the data obtained in our study, the fact that Turkey ranks thirteenth following the scientifically leading countries in terms of articles on Psoriasis is appropriate for Turkey's place in the general ranking. It is noteworthy that Denmark and Sweden, which are among the Northern European countries, are among the top ten countries in the ranking. Although it normally ranks first in the academic field in China, it is quite behind when it comes to publications on Psoriasis. This may be due to the fact that the prevalence of psoriasis is high in Northern European countries, and lower in China compared to North America and Europe, according to World Health Organization data [9].

Among the articles on psoriasis, the most cited article was published in 1994 by Finlay et al. The article focuses on the Dermatology Life Quality Index (DLQI), which is one of the most interesting topics of the time it was published. The Dermatology Life Quality Index (DLQI) was developed as a simple practical questionnaire technique for routine clinical use. It was created based on questionnaire responses by asking 120 patients with different dermatological diseases about the impact of their disease and treatment on their lives. In the study, the effects of Psoriasis on the quality of life were examined, as well as other dermatological diseases [10].

After the article published by Finlay et al. in 1994, the second most cited article was published by Fredriksson et al. In this study, a retinoic acid derivative named Ro 10-9359, which was selected for the study because of its better tolerance than retinoic acid, was investigated. The efficacy of this retinoic acid derivative was evaluated through the psoriasis area and severity index, and it was proven to be an extremely potent antipsoriatic drug [11].

The fact that these articles have been examined and cited more than others lies in the fact that their subject is extremely interesting. Many researchers are planning research on both qualities of life and treatment of the disease. While planning the research, opinions are taken from the published articles, which increases the number of citations of the articles.

When we look at the information about the top five authors who published the most articles analyzed in our research, Peter CM van de Kerkhof, who still works as a Professor at Radboud University and is the principal investigator of the International Psoriasis Council, is the person with the highest number of articles published. Professor van de Kerkhof began his research on Psoriasis in 1979 at the Radboud University Medical Center. His research focused on the pathogenesis and treatment of Psoriasis. He served in international consortia on innovative treatments of psoriasis [12].

Chris Griffiths, Professor at the University of Manchester, is the person with the second-highest number of articles published. His main field of study is Psoriasis. Professor Griffiths was appointed Chair of the University of Manchester Dermatology Foundation in 1994 and is an honorary consultant dermatologist at Salford Royal NHS Foundation Trust. He is the founder of the Manchester Dermatopharmacology Unit and Manchester Psoriasis Service. He is a past president of the British Association of Dermatologists, the European Dermatology Forum, and the International Psoriasis Council [13].

In the first period, 1990-1999, the theme with the highest number of articles published, the most cited and the highest h-index was the "Expression" theme. When the articles published in these years are examined, it is seen that the studies investigating the molecular origins of psoriasis have gained weight. Genes such as the human amphiregulin gene, keratinocyte growth factor, and p53 are some of the genes studied in this regard. This explains the prominence of the "Expression" theme among other themes [14–16].

The theme "Keratinocytes" is the motor theme with the highest number of articles published, the most cited, and the highest h-index in the second period. Psoriasis is characterized by excessive keratinocyte proliferation. It is known that psoriasis is mediated by T cell-mediated immune responses targeting keratinocytes. However, Psoriasis cannot be explained based on T cell activation alone and it is emphasized that changes in epidermal keratinocytes play a crucial role in disease expression. Keratinocytes play a role in initiating, maintaining, and enhancing inflammatory responses, especially by expressing molecules involved in T cell recruitment, retention, and activation. It is also a source of growth factor for angiogenesis. Finally, defects in cytokine and growth factor signaling in keratinocytes are implicated in their abnormal hyperproliferation and differentiation into T-cell-derived signals. 2000-2010 is the period in which this subject was especially examined, and the studies were published. Compared to previous periods, there is a significant increase in the number of articles published in this period. Therefore, it is understood that this theme comes to the fore [17–19].

The theme of "Quality of life", which also has the highest h-index value of the second period, has been among the motor themes recently. According to the World Health Organization, the definition of Quality of life is "an individual's perception of his/her position in life in the context of the culture in which he/she lives and in relation to his/her goals, expectations, standards and concerns". 1994 Dermatology Life Quality Index was developed and published by Finlay et al. It has been mentioned above that this article is the most cited. Following this article, many articles have been published on the subject and experience has been shared. These developments explain that the "Quality of life" theme is the important motor theme of the second and third periods [20–22].

According to the thematic development map findings, the "Etanercept" theme in the second period is related to the

"Adalimumab" theme from the last period. Etanercept is a dimeric fusion protein consisting of the extracellular ligand-binding portion of the tumor necrosis factor-alpha receptor used to treat severe rheumatoid arthritis and Psoriasis. Adalimumab is a recombinant human IgG1 monoclonal antibody specific for human TNF-alpha. Adalimumab inhibits the superficial cell receptors of TNF-alpha.

There are many studies comparing the efficacy, side effects, and some other properties of etanercept and adalimumab. This explains the relationship between the two agents [23–25].

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