REVIEW

A comprehensive bibliometric analysis of the association between atopic dermatitis and depression (1994–2024)

Yan Yang[1,2] · Jun-xiong Li[1,2] · Zi-ling Wang[1,2] · Si-en Zhu[1,2] · Jian-zhou Xie[1,2]

Abstract

In recent decades, the prevalence of atopic dermatitis (AD) has dramatically risen due to modern environmental exposures and drastic lifestyle changes. Furthermore, many studies emphasize that the prevalence of mental health issues, such as depression and anxiety, is much higher among patients with AD compared to the general population. Consequently, there is an urgent imperative to delve into emerging research trends and focal points concerning the association between AD and depression. By analyzing the literature on the correlation between AD and Depression in the Web of Science Core Collection (WoSCC) over the past three decades, our study aims to investigate the key research areas and trends related to the connection between AD and depression through bibliometric analysis, offering useful insights for future researchers in this area. Publications from January 1, 1994, to December 31, 2024, were retrieved from WoSCC on January 5, 2025, and visualized with Excel and Vosviewer software. Summing up to 729 papers were included, authored by 3,670 individuals. The United States, Germany, and the United Kingdom were prominent in researching the link between AD and depression, with the US publishing the highest number of papers—216 in total. Jonathan I. Silverberg stood out as the most prolific author in this field. Keywords visualization analysis revealed that "atopic dermatitis" and "depression" were core topics. It is noteworthy that there has been a significant evolution in research emphasis over time, with studies of AD associated with depression moving from early "pruritus" "psoriasis", and "stress" studies, gradually transitioning into the field of adolescent mental health, suggesting that society's interest in dermatologic conditions and their psychological impact is gradually extending from purely physical symptoms to the broader implications of mental health and quality of life. A thorough bibliometric analysis was initially performed to outline the current state and knowledge framework of the connection between AD and depression, aiming to offer guidance and new insights for future research in this area.

Keywords Atopic dermatitis · Depression · VOSviewer · Visualization · Hotspots · Bibliometrics

Introduction

AD is a chronic inflammatory skin disease characterized by redness, swelling, oozing, flaking, and dryness, often in combination with allergic rhinitis and asthma [1], affecting approximately 200 million people worldwide [2]. A growing body of research suggests a correlation between AD and Depression [3–8]. Patients with AD often suffer from severe itching, leading to decreased sleep quality. Recurrent episodes of the disease seriously affect the mental health and quality of life of the patients, bringing a huge burden to the patients and their families [9, 10]. Numerous studies have shown that the prevalence of mental health problems such as depression and anxiety is significantly higher among AD patients than in the general population [21, 23]. Hence, there is an immediate need to explore the newly emerging research trends and concentrate on understanding the interplay between AD and depression.

Bibliometrics, originally defined by Pritchard [11], is a statistical and mathematical tool for qualitative and quantitative evaluation of academic literature in a specific field and is used as a quantitative method to analyze the literature

✉ Jian-zhou Xie
  1764746800@qq.com

  Yan Yang
  20231121516@stu.gzucm.edu.cn

1 Guangdong Hospital of Integrated Traditional Chinese and Western Medicine, Foshan 528200, China

2 GuangZhou University of Chinese Medicine, Guangzhou 510006, China

within a particular field of study [12]. Analyzing the publications, authors, keywords, research institutions, countries, and journals in this field provides valuable insights into the research trends and future directions. Research hotspots and development direction of the field [13, 14]. Despite the abundance of literature on AD and depression in recent years, there has been a lack of relevant bibliometric analyses [22, 23]. Thus, the objective of this study is to bridge this gap by creating a visualization map that delves into the prevalent research hotspots and anticipates future trends within this domain.

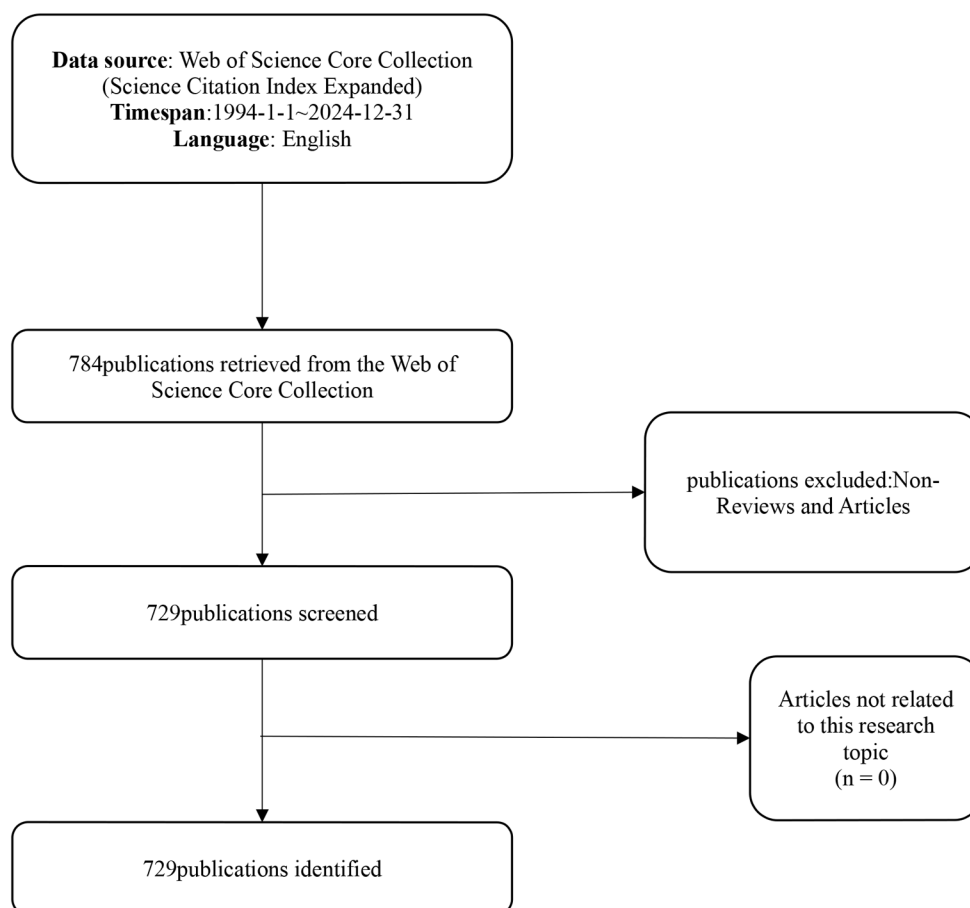## Materials and methods

Data collection

To reduce potential bias from variations in the number of studies and citations, both authors conducted all search operations and data downloads concurrently on January 5, 2025. The strategies for retrieving information and the specific search terms employed were formulated in the manner outlined below: TS= ((atopic dermatitis*) OR (hereditary atopic dermatitis*) OR (Atopic eczema*) OR

(Flexural eczema*) OR (Endogenous eczema*) OR (Neurodermatitis circumscripta*)) AND TS= ((Depression*) OR (Melancholy*) OR (Despondency*) OR (Gloom*) OR (Hopelessness*) OR (Despair*)), The search covered the period from 1994 to 2024, with a language restriction to English and a focus on articles or reviews. Data were downloaded in the "Full Record and Cited References" format and exported as tab-delimited or plain text files using the "Export Records to File" option. These files were then imported into VOSviewer (version 1.6.20) and Microsoft Excel for analysis. The detailed screening process is illustrated in Fig. 1.

Data analysis

This bibliometric analysis was conducted using VOSviewer software, version 1.6.120 (Centre for Science and Technology Studies, Leiden University, Leiden, The Netherlands). It was commonly employed for visualizing and creating bibliometric network maps, encompassing co-authorship, co-citation, and co-occurrence. It offers three varieties of visualization maps: network, density, and overlay, each tailored to a specific purpose and conveying distinct information. In these maps, various nodes signify different entities,

Fig. 1 The process flow of literature selection and data screening

Data source: Web of Science Core Collection (Science Citation Index Expanded)
Timespan:1994-1-1~2024-12-31
Language: English

↓

784publications retrieved from the Web of Science Core Collection

→ publications excluded:Non-Reviews and Articles

↓

729publications screened

→ Articles not related to this research topic (n = 0)

↓

729publications identified

like authors, countries, or institutions. The size of the nodes is based on the quantity of publications, citations, or occurrences linked to the respective item. Connections between nodes represent the relationship or association between these various elements. The correlation between nodes is determined by the total link strength [15]. A greater overall link strength signifies a more robust relationship. For this research, we utilized VOSviewer to perform analyses on keywords, authors, cited articles, co-cited journals and references, as well as countries and institutions.
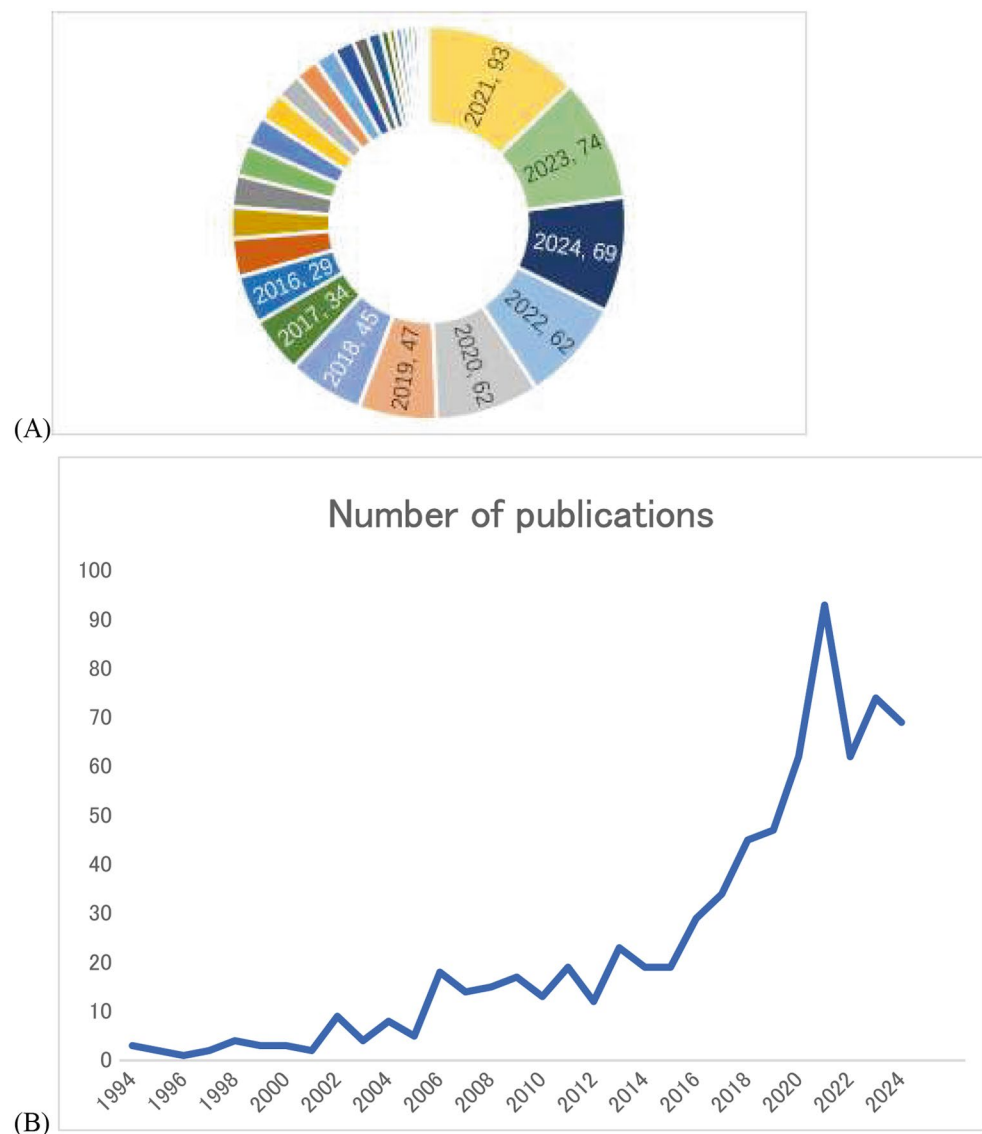
Results

Analysis of publication trends

As shown in Figs. 2 and 729 papers have been published in this research field from 1994 to 2024. The earliest paper on

the association between AD and depression can be traced back to 1994 [16], published in *Psychosomatic Medicine*. To a certain extent, the number of publications per year reflects the development and change pattern of this research field. It is also an important reflection of the identification of hot research [17]. Since 2001, The number of publications on the link between AD and depression has been rising annually. The studies can be divided into 2 stages: the slow growth period and the rapid growth period: 2001–2013 is the slow growth period, and annual publication counts in this stage rose consistently, gradually bringing the connection between AD and depression into the spotlight for researchers, from 2 articles in 2001 to 23 articles in 2013; since 2015, the annual publication count in the related field has notably risen, with 20 of these focused on AD. Since 2015, the number of publications has increased considerably, with 2021 being the peak year for research (93/12.7%). Despite the decline in the number of publications in the last

Fig. 2 The total number of publications per year (1994–2024). (**A**) "Rising Sun" image (**B**) Histogram. Note. The x-axis corresponds to the year of publication and the y-axis to the number of publications

(A)

(B)

three years, the average annual publication count over the last five years has remained stable at 72, indicating that the relationship between AD and depression has always been a focus of academic interest.

Analysis of keywords

Research hotspots are the hotspots of interest to researchers in a certain field, and they are also the main focus of research in the field [18]. Keywords are the core of an article, so they are often used to analyze the research hotspots in a certain field [19]. Keyword co-occurrence analysis is a statistical technique employed to calculate the frequency of keywords in the research of the topic, through the cluster analysis of keywords can better understand the relevance of the keywords and the topic to determine the development

trend and hot issues, which is one of the important ways to track the development of science.

As shown in Fig. 3A, a total of 1321 keywords were extracted in this study. Among them, 48 keywords appeared at least 7 times, and "atopic dermatitis" and "depression" were key to this study and closely related to several other keywords. These keywords were grouped into four clusters: the red cluster pertains to dermatitis and depression, the blue cluster is linked to eczema and mental health, the green cluster is concerned with stress, and the purple cluster represents pruritus.

As shown in Fig. 3B, the studies of AD and depression related to having gradually transitioned to the field of adolescent mental health from the early studies of "pruritus", "psoriasis", and "stress", suggesting that society's attention to dermatologic diseases and their psychological impact has gradually extended from purely physical symptoms to

Fig. 3 (**A**) Co-occurrence network map of keywords related to AD and depression. An analysis of keyword co-occurrence clusters was performed using VOsviewer software. The minimum number of occurrences for each keyword was set to 7 times, including authors who meet the above conditions. A total of 1321 keywords underwent cleaning, with meaningless words eliminated. After merging synonyms, 48 keywords were selected to form a visual map. (**B**) Timeline visualization of co-occurring keywords
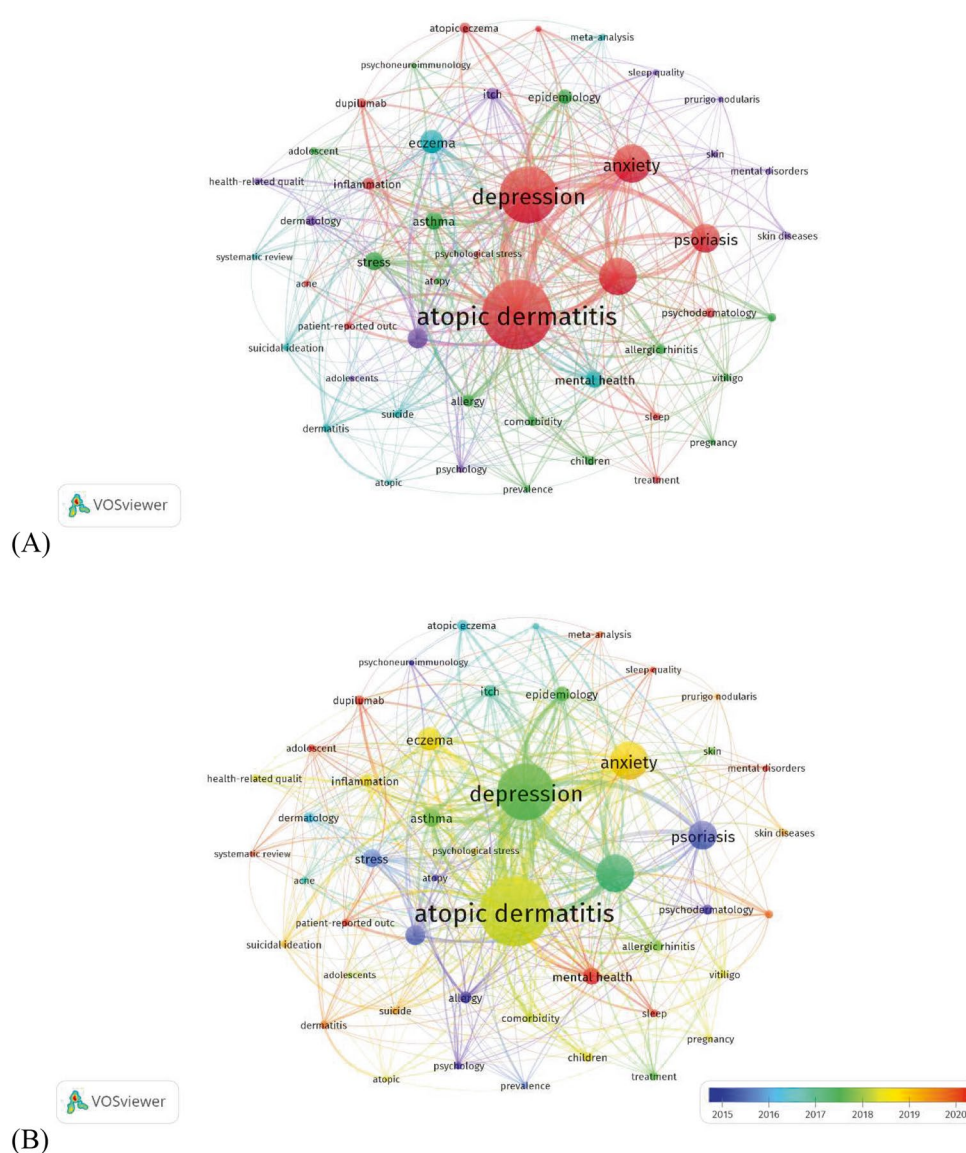

(A)

(B)

Table 1 Top 10 authors who published the most papers on AD and depression

rank	author	documents	citations
1	Silverberg, Jonathan i.	25	956
2	Simpson, Eric l.	17	1801
3	Eckert, Laurent	12	1076
4	Gadkari, Abhijit	10	809
5	Gelfand, Joel m.	9	794
6	Langan, Sinead m.	8	173
7	Staender, Sonja	7	218
8	Feldman, Steven r.	6	501
9	Gieler, Uwe	6	805
10	Gupta, Ak	6	1270

a wider-ranging influence on mental wellbeing and standard of living.

Analysis of authors

From the analysis of author network co-occurrence mapping, it is possible to identify the core authors, authors with a high number of publications, and the level of collaboration among authors, and to visualize whether the publications have been active in recent years. The table was plotted by Excel software (Table 1), Vosviewer software plotted the Cluster network visualization (Fig. 4), with a total of 3,670 authors included, and A total of 729 articles on AD and depression, with 145 being review papers. The author who has published the most articles was Silverberg, Jonathan I., with 25 publications.

As illustrated in Fig. 4, By establishing a threshold of at least 5 publications per author, we created a collaboration map featuring researchers in the area of AD and depression. The size of each circle corresponds directly to the
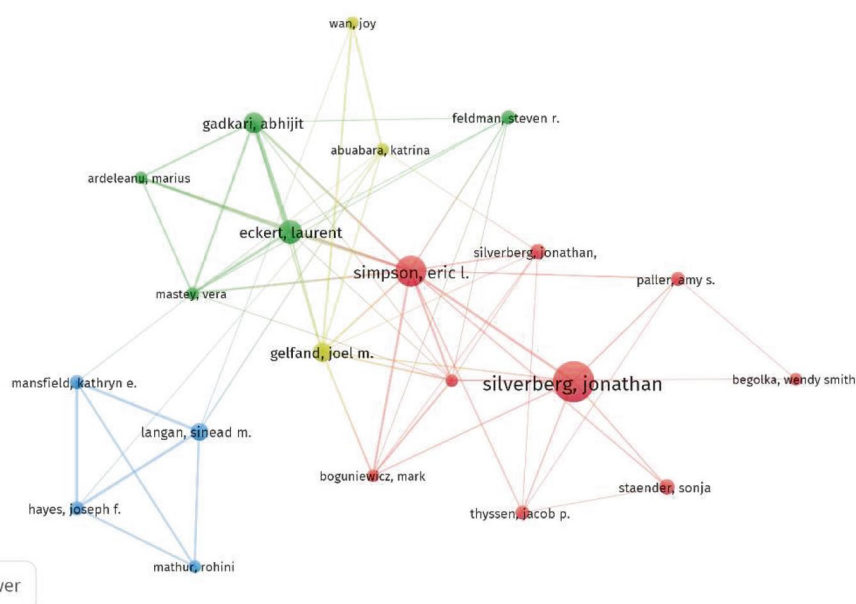
number of articles a researcher has published. The various colors represent distinct clusters, with each author depicted as a node. The font size indicates the publication count, while the number of lines connecting to a node signifies the extent of collaboration. The top three authors, ranked by their publication numbers, are Silverberg, Jonathan I., Simpson, Eric L., and Eckert, Laurent. These authors are grouped into four clusters, each demonstrating strong internal collaboration among its members. The top three authors are Silverberg, Jonathan I., Simpson, Eric L., and Eckert, Laurent. For example, Silverberg, Jonathan I., and Simpson, Eric L. form one cluster, while Eckert, Laurent, and Gadkari, Abhijit form another. In addition, there are positive collaborations between different clusters such as Silverberg, Jonathan I. and Gelfand, Joel M., Simpson, Eric L. and Gadkari, Abhijit. Due to the constraints of the WoSCC data and the limitations of VOSviewer software, differentiating between national and international author collaborations is still difficult.

In general, the authors are closely distributed, and although there are several small-scale collaborations, the number of articles published by certain teams is not very high. Therefore, in-depth studies are still needed to promote cooperation and communication between teams in the future.

Analysis of cited articles

The most frequently cited article on AD and depression was by Finlay A.Y. et al. [20](citations: 110) published in the Journal of Clinical and Experimental Dermatology in 1994. This paper introduced the Dermatology Quality of Life Index (DLQI), a tool designed to assess the impact of skin

Fig. 4 The clustering network visualization highlights the authors of research on AD and depression. Using VOSviewer software, the authors were visualized, with 3,670 authors having published a total of 729 articles related to AD and depression research. Authors who have published at least 5 articles on AD and depression were included in the collaboration map. The size of the circles is positively correlated with the number of articles published by the researchers, and the colors represent different groups

diseases on patients' quality of life [20]. Two [21, 22] of the 10 most frequently cited publications were cross-sectional studies, and a study by Florence J. Dalgard et al. [21](citations: 64) involved a multi-center cross-sectional study of dermatology outpatients across 13 European countries. The results suggested that individuals suffering from AD, hand eczema, and leg ulcers exhibited the highest incidence of depression and anxiety, with approximately one-third of these patients affected. Another cross-sectional study by Jonathan I Silverberg et al. [22] (citations:48) reported that AD is linked to lower overall health evaluations, reduced life satisfaction, and diminished quality of life (QOL) concerning both mental health and skin conditions among the U.S. population. Additionally, two meta-analyses [23, 24] were included. The first [23] (citations:67) revealed a significant positive correlation between adult AD and depression, anxiety, and suicidal ideation, while the second [24] (citations:50) suggested that individuals with AD have a higher incidence of depression and suicide (Table 2).

Analysis of co-cited journals and co-cited references

Table 3 presents the top 10 cited journals, number of citations, impact factor and JCR division, the British Journal of Dermatology received substantially more citations compared to other publications. Notably, the Journal of the American Academy of Dermatology boasts the highest impact factor, suggesting that it publishes highly influential articles. Overall, the research domain cited 5470 journals, with 57 of them being cited 90 times or more (Fig. 5A). Additionally, the research field referenced 25,259 sources, with 46 of these being cited 25 times or more (Fig. 5B). We have visually represented this data in Fig. 5B, which demonstrates that these references are grouped into three clusters characterized by active co-citation relationships, forming the bedrock of the research field.

Table 2 The frequently cited publications on AD and depression

rank	cited reference	citations	Major findings
1	Dermatology Life Quality Index (DLQI)--a simple practical measure for routine clinical use	110	Atopic eczema, psoriasis, and generalized pruritus have a more significant impact on quality of life compared to acne, basal cell carcinoma, and viral warts.
2	Depression and suicidal ideation in dermatology patients with acne, alopecia areata, atopic dermatitis and psoriasis	88	The importance of identifying psychiatric comorbidities, particularly depression, in dermatology patients.
3	Association of atopic dermatitis with depression, anxiety, and suicidal ideation in children and adults: A systematic review and meta-analysis	67	Doctors should consider depression, anxiety, and suicidal ideation when treating patients with AD.
4	Mental health comorbidity in patients with atopic dermatitis	66	A notable association exists between mental health disorders and AD in the pediatric population in the United States.
5	The psychological burden of skin diseases: a cross-sectional multicenter study among dermatological out-patients in 13 European countries	64	The strongest association with depression and anxiety was observed in patients with psoriasis, AD, hand eczema, and leg ulcers.
6	Depression modulates pruritus perception: a study of pruritus in psoriasis, atopic dermatitis, and chronic idiopathic urticaria.	60	The severity of depressive psychopathology was directly correlated with the intensity of pruritus.
7	Atopic dermatitis is associated with anxiety, depression, and suicidal ideation, but not with psychiatric hospitalization or suicide	58	Depression, anxiety, and suicidal ideation are more prevalent among individuals with AD.
8	Association between Atopic Dermatitis and Depression in US Adults	57	Approximately one in three U.S. adults with AD reported symptoms of depression.
9	Association between atopic dermatitis, depression, and suicidal ideation: A systematic review and meta-analysis	50	Patients with AD have higher odds of depression and suicidality.
10	Patient burden and quality of life in atopic dermatitis in US adults: A population-based cross-sectional study	48	AD is associated with lower overall health ratings, reduced life satisfaction, and impaired quality of life (QOL) related to both mental health and skin conditions in the U.S. population.

Table 3 Top 10 cited journals, number of citations, impact factor, and JCR division

id	Cited journals	citations	impact factor	JCR division
1	British Journal of Dermatology	2475	11	Q1
2	Journal of the American Academy of Dermatology	1558	12.8	Q1
3	Acta Dermato-Venereologica	1413	3.5	Q1
4	Journal of the European Academy of Dermatology and Venereology	1017	8.4	Q1
5	American Journal of Clinical Dermatology	942	8.6	Q1
6	International Journal of Dermatology	625	3.5	Q1
7	Psychosomatic Medicine	612	2.9	Q1
8	Annals of Allergy Asthma & Immunology	573	5.8	Q1
9	Allergy	466	12.6	Q1
10	JAMA Dermatology	332	11.5	Q1

Analysis of constitution

Table 4 lists the top 10 institutions that have published the greatest number of papers. Northwestern University (documents: 37 citations: 3226) ranked first, followed by George Washington University (documents: 30 citations: 338), and Oregon Health & Science University (OHSU)(documents: 24 citations: 3489). Among the top 10 institutions publishing research papers on AD and depression, the top three are all U.S.-based institutions. Figure 6 depicts the institutions that have published seven or more papers, showcasing that they are categorized into four clusters and actively participate in collaborative efforts. Oregon Health & Science University (OHSU) is affiliated with 25 other institutions. Notably, no institution in China has been found to have published seven or more papers. The possible reason for this is that the relevant articles published by them are not included in WoSCC, which makes it difficult to count the relevant results on this platform, and thus they are not included in the statistical scope of such databases.

Analysis of countries

The statistics for the top 10 countries by publication count were plotted using Excel software (Table 5). The results showed that an aggregate of 66 countries (regions) have published papers in this domain from 1994 to 2024, among which the US, Germany, and the UK are the leading countries researching the link between AD and depression, while the US has published the most papers in this area, with 216 papers, making up 29.6%, the highest proportion of the total publications. The United States has published the highest number of papers in this field, totaling 216, which represents 29.6% of the overall total. This suggests that the US may place greater emphasis on research in this area, and also indicates that may have more related patients. Germany and the UK occupy the second and third positions, respectively, in terms of the number of papers published, with a share of 14.1% and 10.3% respectively. These three countries contributed to 54% of the total publications. Among the 10 countries with the highest publication counts, only China is a developing country, and the remaining 9 countries are all developed countries, indicating that the international pattern of research on the link between AD and depression, with less research output from developing countries such as China, may be related to the low level of public concern and attention to the connection between AD and depression in China.

The paper data was imported into VOSviewer (1.6.20) software for processing. In the analysis of the cooperation network, the circle size represents the publication volume of each country or region, and the links between the circles indicate the connection between countries, the larger the circle indicates the higher number of publications, and the denser the links indicate the stronger the cooperation relationship.

As illustrated in Fig. 7A, there exists a degree of cross-regional collaboration in exploring the link between AD and depression among nations globally, and there is also some geographical cooperation. For example, among Asian countries, China, Japan, and South Korea cooperate closely; among European countries, Germany, France, and the UK cooperate closely; among North American countries, the US and Canada cooperate closely; this may be because these countries are regionally closer, and therefore have reached a consensus on the connection between ad and depression. However, even though the US, Germany, and China are not located in the same geographic region, they also maintain relatively close collaboration in this field, which suggests that researchers' perceptions of the relationship between AD and depression are converging, prompted by the global health endeavor, which has led to cross-regional partnerships. Figure 7B shows that China only began to gradually focus on this research area in 2022, despite the late start, the increasing number of publications each year highlights significant progress and indicates considerable potential for further development in this field.

Discussion

General information

This study included 729 papers authored by 3,670 individuals from 66 countries, affiliated with 1,357 institutions. The

Fig. 5 (**A**) Co-citation network of journals in AD and depression research. A total of 5,470 articles were cited, with 57 articles being cited more than 90 times. The size of the circles is positively correlated with the number of citations. (**B**) Cooperation network map of co-cited references in AD and depression research

papers were published across 255 journals. A total of 25,259 references were cited, with 57 of them being cited over 90 times, indicating a broad knowledge base and significant interest in this research area.

An analysis of publication volume showed a significant surge in research on AD and depression beginning in 2015, resulting in an average of 72 papers being published annually between 2022 and 2024. Upon analyzing the distribution of authors in this field, it was found that the majority of the most productive and influential researchers are from the United States. Some non-U.S. researchers also reported novel and influential studies [25], but these were relatively few and did not achieve quantitative or qualitative growth. According to the findings of the collaborative model analysis, researchers studying attention deficit disorder and depression can be categorized into four main groups. The first group is a team of researchers centered on Jonathan I. Silverberg of the George Washington University School of Medicine and Health Sciences in the U.S. This group's research focuses on the treatment of Attention Deficit

Table 4 The top 10 institutions contributing to publications of AD and depression

id	organization	documents	citations
1	Northwestern University	37	3226
2	George Washington University	30	338
3	Oregon Health & Science University	24	3489
4	University of Copenhagen	23	1391
5	Karolinska Institute	19	407
6	King's College London	18	371
7	Sanofi	18	3107
8	University of Toronto	17	1565
9	University of Pennsylvania	16	1026
10	Aarhus University Hospital	13	2088

Table 5 The top 10 countries publishing research on AD and depression

rank	Country	Number of publications
1	USA	216
2	Germany	103
3	England	75
4	South Korea	64
5	Italy	60
6	China	52
7	Canada	48
8	France	44
9	Denmark	41
10	Japan	38

Disorder (AD) [26] and its relationship with depression correlation between AD and depression [27]. The second group, led by Laurent Eckert of the French multinational pharmaceutical company Sanofi, focuses on the burden of disease in adult AD [28–30]. Although some small-scale collaborations exist, some of the teams have a low number of published articles. Therefore, more in-depth studies are still needed in the future to promote collaboration and communication between teams.

The most popular journal for AD and depression research is the British Journal of Dermatology, followed by the Journal of the American Academy of Dermatology. Both journals are top dermatology journals covering a wide range of clinical and basic dermatological sciences with a global reach. Closely followed by the Swedish Society for Dermatology and Venereology and the European Academy of Dermatology and Venereology are among the most influential journals in the European region. The top 10 journals

show a significant concentration of research focused on AD and depression within their respective subdisciplines, with a particular focus on allergy, immunity, mental health, and related areas. This highlights the growing emphasis on AD and depression research globally.

Northwestern University is the top-ranked institution among the institutions analyzed, with a strong publication output and a relatively small gap to other leading institutions. Notably, the collaboration between Northwestern University, George Washington University, and Oregon Health & Science University is especially active. However, the strong connections between U.S. research institutions and the limited international collaborations have somewhat constrained the academic growth and global impact of U.S. research institutions. Additionally, no Chinese institution has yet published more than seven studies related to AD and depression in the WoSCC database, a phenomenon that

Fig. 6 A cluster network visualization highlighting the collaboration among 1,357 institutions in AD and depression research, based on 729 published articles. Different colors represent distinct clusters, formed based on the co-citation network of documents between institutions. Institutions with strong co-citation relationships are grouped, and a hierarchical clustering diagram is generated to illustrate their interconnections; the thickness of the lines connecting the circles represents the strength of cooperation between institutions, while the size of the circles is positively correlated with the number of articles published by the institutions
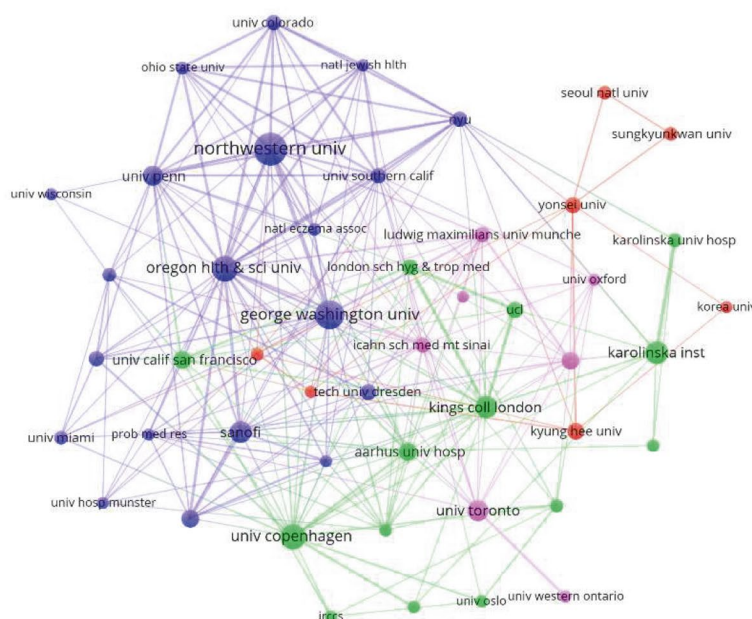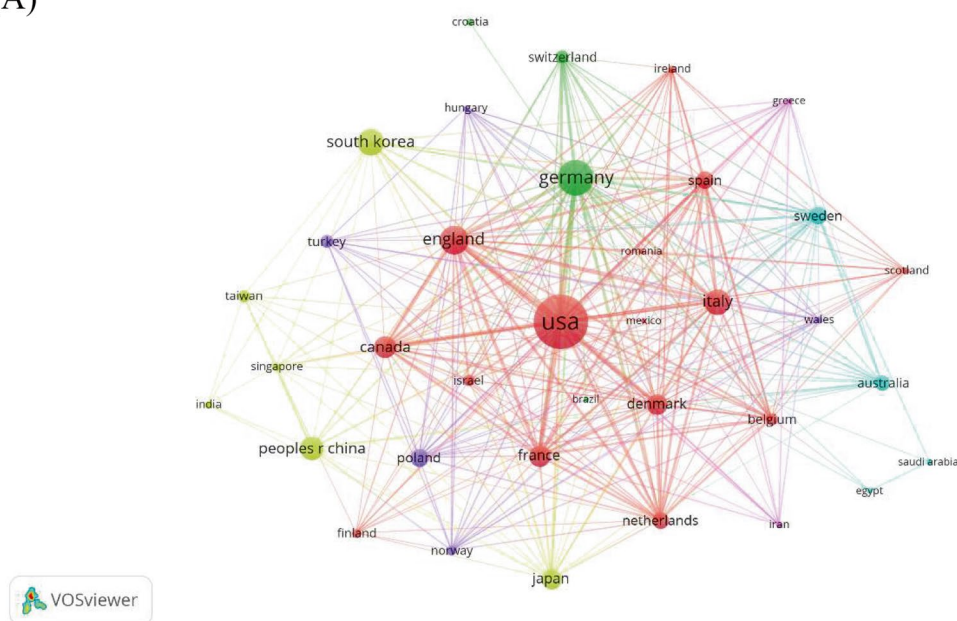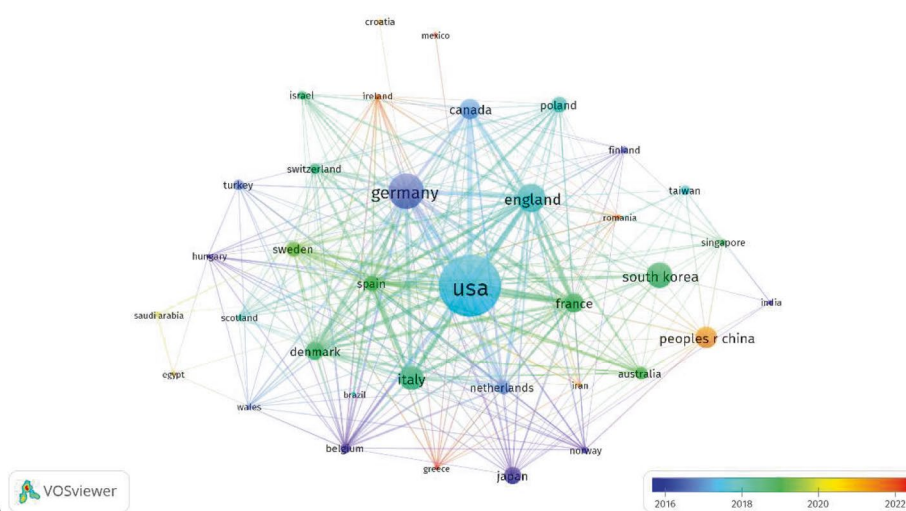
Fig. 7 (**A**) network map illustrating collaborative relationships between countries/regions in the research on AD and depression. To create the national cooperation map, countries that have published at least 5 articles on AD and microbiota were included. Each peripheral curve segment represents a country, and the thickness of the connection is proportional to the intensity of cooperation between countries. (**B**) Timeline visualization of co-occurring country

warrants attention and presents potential opportunities for future research and development.

Strengths and limitations

This study represents the inaugural detailed analysis of research trends concerning the association between AD and depression through bibliometric analysis, however, it is important to acknowledge its limitations. First, the use of the WoSCC database for the search may result in incomplete inclusion of papers and some bias. Second, the utilization of VOSviewer for bibliometric analysis and visualization can be influenced by variations in software settings, potentially impacting the study's results due to the authors' subjective judgments. Third, limiting the language to English and the literature type to articles and reviews may not be entirely comprehensive. In the future, we will continue to pay attention to the inclusion of this field in other databases, and combine various tools to analyze the literature.

Conclusion

Throughout the past 30 years, the overall trend of papers published in this research area has been on the rise, reflecting growing interest in the study of AD and depression. As the research continues to deepen, researchers have gradually transitioned from analyzing the correlation between AD and

depression to the field of adolescent mental health, suggesting that society's attention to skin diseases and their psychological impact has gradually extended from purely physical symptoms to the broader impact of mental health and quality of life. In summary, as the pioneering bibliometric study examining AD and depression, this research reviews the trends in this field over the past 30 years, identifies key research hotspots, and outlines potential future research directions, serving as a valuable reference for ongoing studies in this area.

Declarations

Competing interests The authors declare no competing interests.

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