Global research trends and mapping knowledge structure of depression in dialysis patients

Samah W Al-Jabi

Samah W Al-Jabi, Department of Clinical and Community Pharmacy, College of Medicine and Health Sciences, An-Najah National University, Nablus 44839, Palestine

Corresponding author: Samah W Al-Jabi, PhD, Associate Professor, Department of Clinical and Community Pharmacy, College of Medicine and Health Sciences, An-Najah National University, Academic Street, Nablus 44839, Palestine. samahjabi@yahoo.com

Abstract

BACKGROUND
Depression is one of the most common and important psychological issues faced by dialysis patients. It can make it more difficult for them to adhere to their treatment regimen, which, in turn, can worsen their physical symptoms and lead to poorer health outcomes.

AIM
To examine the evolution and growth of publications related to dialysis and depression. The objectives were to identify the number of publications, the top active countries, the contributed institutions, funding agencies and journals, as well as to perform citation and research theme analysis.

METHODS
The search was conducted using the Scopus database for publications related to dialysis and depression between 1970 and 2022. Subsequently, bibliometric analysis was carried out on the data obtained using VOSviewer software, version 1.6.9. This analysis included visualization analysis, co-occurrence analysis and examination of publication trends in dialysis and depression.

RESULTS
We identified 800 publications that met the search criteria. The number of publications related to dialysis and depression has increased significantly in the past two decades. The USA led the way with 144 publications, which is 18% of all publications on this topic. Turkey came second with 88 publications (11%), followed by China with 55 publications (6.88%) and Iran with 52 publications (6.5%). Analysis of the research theme identified three main clusters related to gender differences in prevalence, identification of depression as a risk factor, and effective interventions to relieve depression. Future research direction analysis shows a shift toward effective interventions to relieve depression in dialysis patients.

CONCLUSION

This study provides a comprehensive overview of growth, trends and research themes related to dialysis and depression that could help researchers identify gaps in the literature and develop future research.

Key Words: Dialysis; Depression; Bibliometric; Hot issues; Scopus

Core tip: Depression is a prevalent psychological problem among dialysis patients, and it can negatively impact their adherence to treatment and health outcomes. A total of 800 publications were identified through a bibliometric analysis of dialysis- and depression-related publications between 1970 and 2022. In the last two decades, there has been a significant increase in the number of publications, and the USA led the way. The identified research themes were gender differences in depression prevalence, the identification of depression as a risk factor, and effective interventions to treat depression. Effective interventions to ameliorate depression in dialysis patients will be the focus of future research endeavors.

INTRODUCTION

Dialysis is life-sustaining management for patients who have lost renal function due to kidney failure[1,2]. Although it can be an effective treatment for many, it is a complex and demanding procedure that can have significant effects on patients' physical, mental and emotional well-being[3,4]. Depression is a prevalent mental health issue that dialysis users regularly experience[5]. A sensation of despair, hopelessness and helplessness characterizes this syndrome[6]. The stress and ambiguity of treating a chronic illness such as renal failure, as well as the other lifestyle changes that occur alongside dialysis therapy, such as changes to one's diet and daily routine, may all contribute to the onset of depression[7].

According to one study, depression can dramatically affect dialysis patients' quality of life[8]. This can result in psychological and physical symptoms such as weariness, sleeplessness, lack of appetite and loss of interest in previously rewarding activities[9]. Furthermore, depression might make it more difficult for patients to stick to their treatment plan, exacerbating physical symptoms and resulting in poorer health outcomes[10-12]. Several studies have been conducted in recent years to investigate the link between dialysis and depression[13-17]. According to several studies[18-21], depression is more prevalent among dialysis patients than among the general population. Additionally, another study suggests that certain characteristics, such as dialysis duration or changes in dialysis, may increase the incidence of depression[22,23].

A research methodology that studies the organization of academic literature to indicate research trends, patterns and areas of competence is bibliometric and visualization mapping. We may acquire a clearer grasp of the field's structure and geography, identify gaps in knowledge and highlight key contributions by using this methodology to study dialysis and depression[24-27]. This paper reviews the current state of dialysis and depression research, identifies the most influential research publications and institutions and outlines prospective future research directions. It also seeks to provide a complete overview of dialysis and depression research, highlight major research trends and knowledge gaps, and make recommendations for future research. In addition, this study can help researchers to identify voids in the current literature and guide future efforts to advance our understanding of the complex relationship between dialysis and depression.

MATERIALS AND METHODS

Data acquisition

Scopus was chosen to retrieve the publication sources. To avoid potential bias from the daily updates in Scopus, the documents for this study were retrieved and saved on April 12, 2023. The majority of bibliometric studies use Scopus[28-32] and Web of Knowledge[33-35]. Scopus is regarded as the most advantageous database for such analyses due to its numerous benefits[36-40]. Its bibliometric indicators are simple and straightforward. In addition, Scopus includes publications from Medline. Scopus has a number of benefits over Google Scholar and Web of Science. It has a more comprehensive database for bibliometric analysis and covers social sciences and humanities. Its unique characteristics, such as author identification, improve the tracking and evaluation of academics' influence on a particular topic. By offering filtering and sorting options, Scopus facilitates the discovery of relevant research.

Search strategy

A detailed review of the systematic and meta-analysis research on the topic was undertaken to establish the search approach, as referenced in the sources[18-21]. Scopus Engine was used to integrate relevant words connected with dialysis and depression, including Medical Subject Headings from PubMed and prior systematic reviews and meta-analyses. There were four steps in the research strategy. (1) The initial step involved using specific terms and phrases related to dialysis to conduct a title search, which included the following. TITLE ("artificial kidney therapy") OR TITLE (*dialysis*) OR TITLE (extracorporeal therapy) OR TITLE (Hemofiltration) OR TITLE (hemodiafiltration) OR TITLE (hemoperfusion) OR TITLE ("continuous renal replacement therapy"). (2) The second step used specific terms and phrases that are related to depression to conduct a title search that included the following: (TITLE (depress*) OR TITLE (dysthym*) OR TITLE ("seasonal affective") OR TITLE ("bipolar disorder") OR TITLE ("mood disorder*") OR TITLE ("affective disorder")). (3) In the third step, the first two steps were merged and filtered by implementing exclusions and limitations. The search was conducted in Scopus, including articles published up to December 31, 2022, without language restrictions. The research methodology employed the wildcard symbol (*) and quotation marks ("") to refine the search for particular terms or phrases. Errata and retracted documents were excluded from the analysis. (4) The search query resulted was as follows: ((TITLE(depress*) OR TITLE("seasonal affective") OR TITLE(dysthym*) OR TITLE("affective disorder") OR TITLE("mood disorder*") OR TITLE("bipolar disorder")) AND ((TITLE ("Artificial kidney therapy") OR TITLE (*dialysis*) OR TITLE (Extracorporeal therapy) OR TITLE (Hemofiltration) OR TITLE (Hemodiafiltration) OR TITLE (Hemoperfusion) OR TITLE ("Continuous renal replacement therapy")) AND PUBYEAR < 2023)) AND (EXCLUDE (DOCTYPE,"er")).

The search strategy used involved searching for the title using specific keywords rather than searching for both the title and the abstract simultaneously. This approach is considered reliable because it yields minimal false-positive results[41-45]. In contrast, searching for both titles and abstracts may result in a large number of false positives, as the studies' primary focus is on topics other than dialysis and depression.

Validation of the search strategy

The author has taken several steps to ensure the accuracy and reliability of the search query. Firstly, the author improved the query to eliminate false positives. Then, we examined the top 50 most cited papers for relevance to the search subject. Two bibliometric specialists evaluated the title and abstract of these papers and ensured that there were no false positives. The search query was declared complete once it was completed. To confirm that there were no false negatives, the author ran a correlation test between the collected data and the real findings of the field's 20 most active researchers. This test found a strong correlation (r = 0.960) and a significant result (P = 0.001), showing that the search query was precise. This validation method has already been employed in bibliometric studies[46-48]. The rigorous approach and cooperation of two bibliometric specialists enhanced the findings' trustworthiness, and the correlation test gave additional support.

Indices of research productivity

The data collected served as the basis for generating the following information[32,49,50]: (1) Comprehensive analysis and trends of global contributions in publications regarding dialysis and depression from 1970 to 2022; (2) examination of scientific research productivity and collaboration patterns by country; (3) evaluation of research productivity among the most prolific institutions; (4) identification of funding agencies involved; (5) determination of the journals in which international researchers published their work; and (6) assessment of the citations received by these publications.

Bibliometric indicators were utilized to rank the data using the standard competition ranking methodology. Only the top 10 rankings were considered and if two ranking numbers were the same, a gap was left in the subsequent ranking numbers (*e.g.*, 1, 2, 3, 3 and 5)[51]. The quality of research productivity was assessed using the *h*-index, which represents the number of articles (*h*) that have received at least *h* citations[52]. For example, if a researcher has 50 published journal articles, they would have an h-index of 10 if 10 of those papers have received at least 10 citations each and the remaining 40 papers have fewer than 10 citations each. The impact factor was used as an indicator to gauge the importance of the journals, evaluated using the Journal Citation Report (Clarivate Analytics) for the year 2022.

The presented Impact Index per Article refers to the top 10 highly cited papers obtained from the Reference Citation Analysis (RCA) database, which is an open, multidisciplinary citation analysis database owned by Baishideng Publishing Group, located in Pleasanton, CA, USA[53-55].

Visualization analysis

VOSviewer software (version 1.6.9, Leiden University, Leiden, The Netherlands) was used to create network maps depicting the relationships between terms identified in titles or abstracts, as well as cross-national cooperation[56-58]. VOSviewer allows the establishment of knowledge networks by utilizing co-occurrence analysis, which provides a scientific foundation for projecting future research hotspots and following the advancement of various research disciplines[56-58]. By clustering terms based on their co-occurrence, VOSviewer assigns a unique color to each cluster, which can be used to identify and analyze research hotspots more effectively. This approach allows for the visualization and detection of developing trends. Terms are represented as nodes and the associations between them are depicted as lines or links. The thickness of the lines represents the strength of the association between the terms.

$$y = 0.9135e^{0.087x}$$
$$R^2 = 0.8837$$
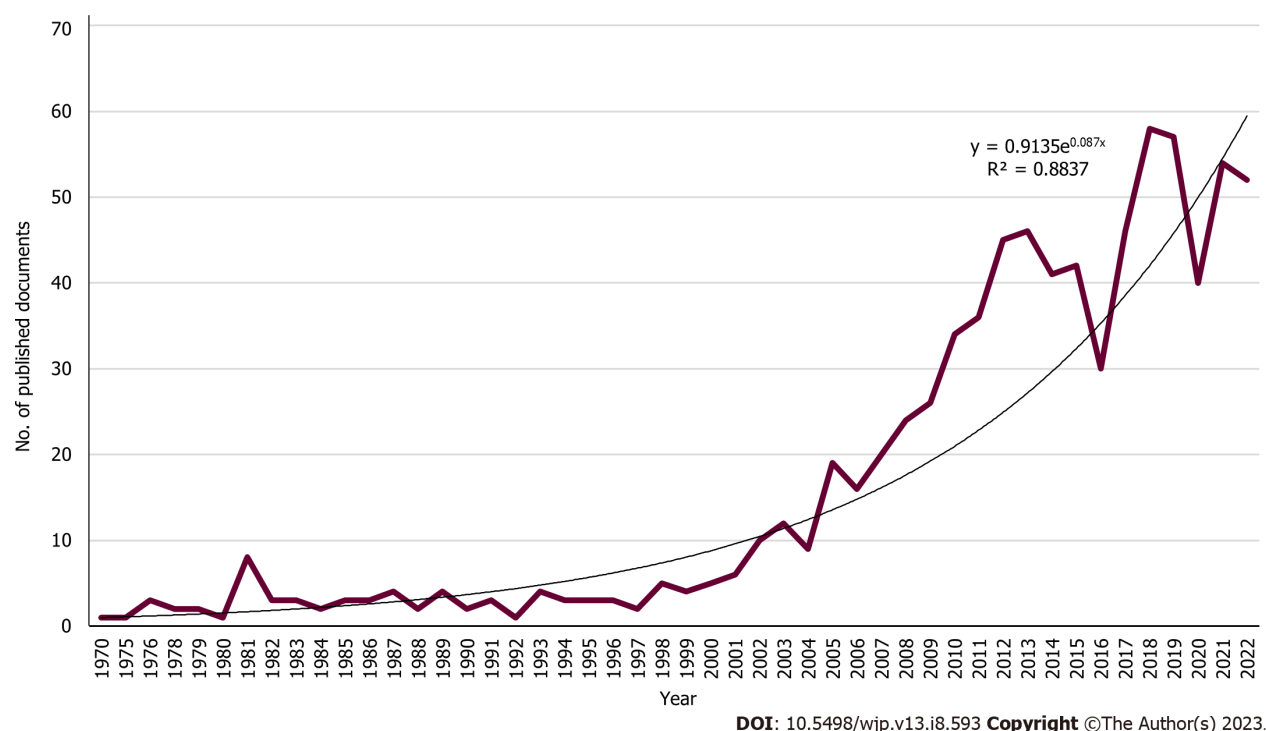
Figure 1 Number of articles analyzed in a bibliometric study on global dialysis and depression-related publications between 1970 and 2022.

RESULTS

Evolution and growth of publications

We identified 800 publications that met the search criteria between 1970 and 2022. Of these, 707 (88.38%) were original research articles, 33 (4.13%) were reviews, 29 (3.63%) were letters to the editor and 31 (3.88%) fell under other categories, such as notes or editorials. The number of publications related to dialysis and depression has increased significantly in the last two decades, with fewer than three articles published annually before 2002. However, since 2013, the number of publications related to dialysis and depression has grown much more rapidly, with more than 46 articles published annually (Figure 1).

Top active countries

In fact, 93 countries have contributed to the literature on dialysis and depression, according to Scopus. The USA led the way with 144 publications, which was 18% of all publications on this topic; Turkey came second with 88 publications (11%), followed by China with 55 publications (6.88%) and Iran with 52 publications (6.5%) (Table 1). Figure 2 depicts the countries with > 10 publications on dialysis and depression, highlighting their collaborative network. The larger the circle, the more publications from that country will be published; and the thicker the line, the stronger the collaboration. The width and number of lines on the map reflect the intensity and degree of interaction between the countries represented. We focused on five VOSviewer clusters to assess their centrality and linkages with other countries. The data are based on a study of 21 countries (as seen in Figure 2), with the USA and Turkey contributing the most publications to the purple cluster.

Contributing institutions

According to Table 2, the top 10 institutions in the study generated a total of 89 publications, representing 11.13% of all the analyzed publications. On examining the papers related to dialysis and depression, the Leids Universitair Medisch Centrum came out on top, producing 18 publications, followed by the Onze Lieve Vrouwe Gasthuis with 14 publications, the VA Medical Center with 13 publications and the University of Hertfordshire with 13 publications.

Contributed funding agencies

Table 3 shows the leading funding agencies according to their production. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the National Institutes of Health (NIH) and the Japan Society for the Promotion of Science (JSPS) emerged as the most productive funding agencies, the NIDDK leading with 26 (3.25%), followed by the NIH with 15 (1.88%) and the JSPS with 11 (1.38%).

Table 1 Top 10 countries ranked by article output on dialysis and depression from 1970 to 2022

Ranking	Country	No. of documents	%
1	USA	144	18.00
2	Turkey	88	11.00
3	China	55	6.88
4	Iran	52	6.50
5	Brazil	42	5.25
5	United Kingdom	42	5.25
7	Japan	38	4.75
8	South Korea	37	4.63
9	Taiwan	35	4.38
10	Canada	25	3.13

Table 2 Top 10 institutions with the highest frequency of article publications on dialysis and depression worldwide, ranked by productivity

Ranking	Institute	Country	No. of documents	%
1	Leids Universitair Medisch Centrum	Netherlands	18	2.25
2	Onze Lieve Vrouwe Gasthuis	Netherlands	14	1.75
3	VA Medical Center	USA	13	1.63
3	University of Hertfordshire	UK	13	1.63
5	Amsterdam UMC	Netherlands	12	1.50
5	The Lister Hospital	UK	12	1.50
5	The University of Jordan	Jordan	12	1.50
8	University of Toronto	Canada	11	1.38
9	The George Washington University	USA	10	1.25
9	King's College London	UK	10	1.25
9	Başkent Üniversitesi	Turkey	10	1.25

Contributing journals

Table 4 lists the top 10 journals ranked by number of publications, which together make up approximately 21.16% of all publications. *International Urology and Nephrology* had the highest number of publications, with 24, followed by *Renal Failure* with 20 publications and *Kidney International* with 16 publications.

Citation analysis

In total, the top 10 articles received 2715 citations, with an average of 271.5 citations per article. The number of citations ranged from 206 to 446[59-68]. Table 5 displays the publications that garnered > 205 citations and were among the top 10. The impact index per article of the 10 most cited articles ranged from 4.9 to 16.6 (Table 5).

Research themes in the literature on dialysis and depression

Figure 3 presents the most commonly used terms in the titles and abstracts of the articles related to dialysis and depression. The size of the circle indicates the frequency of the term, while the distance between two circles or terms indicates their co-occurrence. The terms are grouped based on their close relationship and are represented by different colors. Cluster analysis identified three main clusters, displayed in green, blue and red. The green cluster relates to "gender differences in the prevalence of depression and anxiety among dialysis patients", the red cluster to "identification of depression as a potential risk factor for poor outcomes in dialysis patients", and the blue cluster to "effective interventions to alleviate depression in dialysis patients". The blue cluster was significantly associated with terms from other clusters. Overall, the three clusters are presented in Figure 3.

Table 3 The top ten funding agencies that have the most publications in research related to dialysis and depression from 1970 to 2022

Ranking	Funding agencies	Country	No. of publication	%
1	National Institute of Diabetes and Digestive and Kidney Diseases	USA	26	3.25
2	National Institutes of Health	USA	15	1.88
3	Japan Society for the Promotion of Science	Japan	11	1.38
4	National Center for Advancing Translational Sciences	USA	9	1.13
5	National Heart, Lung, and Blood Institute	USA	8	1.00
5	National Natural Science Foundation of China	China	8	1.00
5	Nierstichting	Netherlands	8	1.00
8	National Institute for Health Research	UK	7	0.88
9	Conselho Nacional de Desenvolvimento Científico e Tecnológico	Brazil	5	0.63
9	National Institute of Mental Health	USA	5	0.63
9	US Department of Veterans Affairs	USA	5	0.63

Table 4 The top 10 journals in research related to dialysis and depression

Ranking	Journal/source title	No. of documents	%	IF[1]
1	*International Urology and Nephrology*	24	3.0	2.266
2	*Renal Failure*	20	2.50	3.222
3	*Kidney International*	16	2.0	18.988
4	*Clinical Journal of the American Society of Nephrology*	15	1.88	10.614
4	*General Hospital Psychiatry*	15	1.88	7.587
4	*Journal of Psychosomatic Research*	15	1.88	4.62
4	*Nephrology Dialysis Transplantation*	15	1.88	7.186
8	*American Journal of Kidney Diseases*	14	1.75	11.072
9	*Hemodialysis International*	13	1.63	1.543
10	*BMC Nephrology*	11	1.38	2.585
10	*Clinical Nephrology*	11	1.38	1.243

[1]Journal Citation Reports (Clarivate, 2022).

IF: Impact factor.

Future research direction analysis

In Figure 4, VOSviewer assigned distinct colors to each term based on the frequency of its appearance in all retrieved publications. Blue was assigned to the terms that first emerged in the literature, whereas yellow was assigned to those that were recently discovered. Before 2014, research in this field focused on the connection between "gender differences in the prevalence of depression and anxiety among dialysis patients" and "identification of depression as a possible risk factor for poor outcomes in dialysis patients". However, the latest research trends, discovered after 2014, revolved around "effective interventions to alleviate depression in dialysis patients".

DISCUSSION

Bibliometric analysis is a useful method for evaluating the global research landscape of a specific field. This work's analysis provides insights into the research on depression and dialysis, demonstrating that it has been a topic of interest to scientists worldwide. The prominence of the USA, Turkey and China suggests that these nations may have made distinctive contributions to the discipline. This analysis also yields the identification of notable contributors, such as institutions, journals and funding agencies. These contributors may serve as valuable resources for future researchers seeking collaboration or funding. Identified trends and concentrations in the field of research can help to guide future investigations and inform policy decisions regarding depression and dialysis. Forecasting future developments is also

Table 5 The ten most cited publications in research related to dialysis and depression from 1970 to 2022

Ranking	Ref.	Title	Source title	Cited by	Impact Index Per Article[1]
1	Kimmel *et al*[63], 2000	Multiple measurements of depression predict mortality in a longitudinal study of chronic hemodialysis outpatients	*Kidney International*	446	15.7
2	Lopes *et al*[66], 2002	Depression as a predictor of mortality and hospitalization among hemodialysis patients in the United States and Europe	*Kidney International*	434	16.6
3	Watnick *et al*[67], 2003	The prevalence and treatment of depression among patients starting dialysis	*American Journal of Kidney Diseases*	258	11.1
4	Hedayati *et al*[61], 2006	The predictive value of self-report scales compared with physician diagnosis of depression in hemodialysis patients	*Kidney International*	243	12.1
5	Kimmel *et al*[64], 1993	Survival in hemodialysis patients: The role of depression	*Journal of the American Society of Nephrology*	235	6.7
5	Lopes *et al*[65], 2004	Screening for depression in hemodialysis patients: associations with diagnosis, treatment, and outcomes in the DOPPS.	*Kidney international*	233	10.3
7	Watnick *et al*[68], 2005	Validation of 2 depression screening tools in dialysis patients	*American Journal of Kidney Diseases*	231	11.3
8	Craven *et al*[59], 1988	The Beck Depression Inventory as a screening device for major depression in renal dialysis patients.	*International journal of psychiatry in medicine*	220	4.9
9	Kimmel and Peterson [62], 2005	Depression in end-stage renal disease patients treated with hemodialysis: Tools, correlates, outcomes, and needs	*Seminars in Dialysis*	209	10.8
10	Finkelstein and Finkelstein[60], 2000	Depression in chronic dialysis patients: Assessment and treatment	*Nephrology Dialysis Transplantation*	206	6.6

[1]The Impact Index Per Article is presented based on *Reference Citation Analysis* [Source: Baishideng Publishing Group Inc (Pleasanton, CA 94566, United States)].
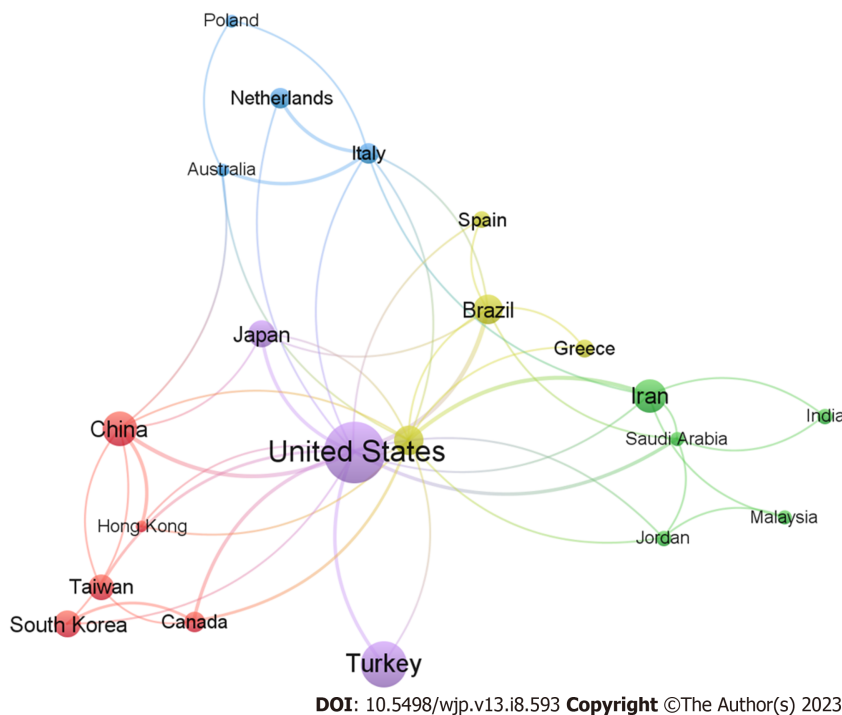
Figure 2 Visualization of the network of international research collaboration on dialysis and depression among 21 countries with a minimum research output of 10 documents. VOSviewer software version 1.6.19 was used to generate the map.

beneficial for researchers, clinicians and policymakers who wish to anticipate future requirements and plan accordingly.

This study reveals that the amount of research evaluating the literature on dialysis and depression has increased consistently over the past two decades. In the foreseeable future, the amount of research into the connection between
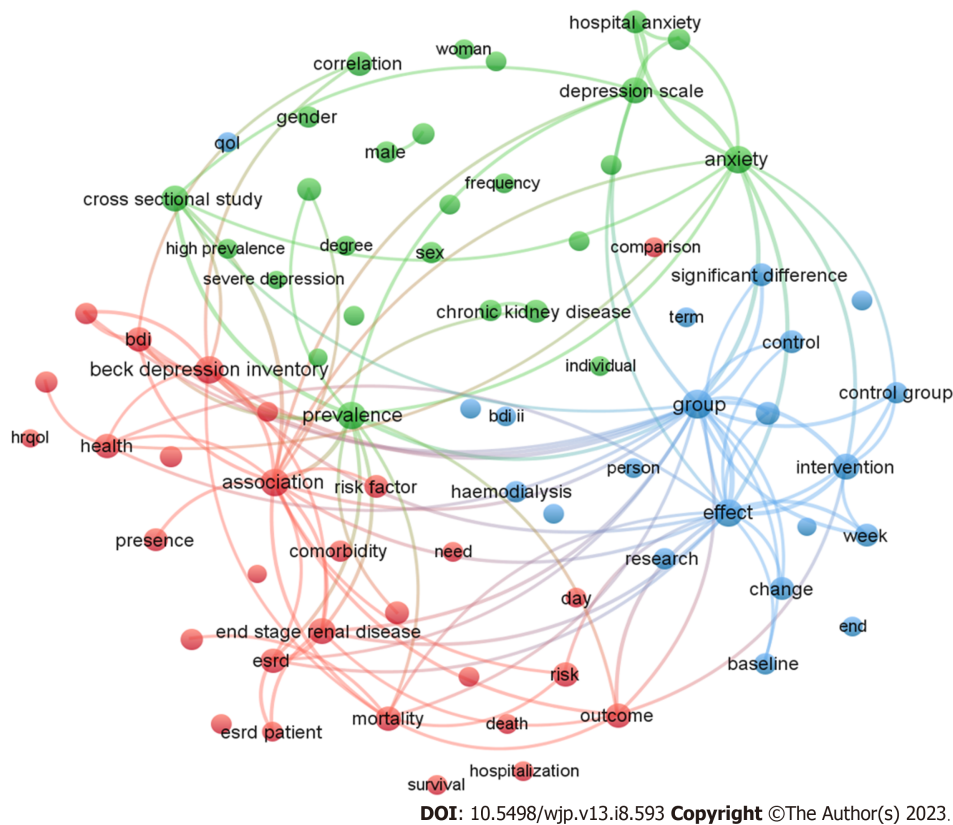
Figure 3 Map visualizing the network analysis of terms found in titles and abstracts, with a minimum frequency of ten or more. Terms are represented as nodes, and the associations between them are depicted as lines or links. The thickness of the lines represents the strength of the association between the terms. VOSviewer software version 1.6.19 was used to generate the map.

dialysis and depression is likely to increase. This is due to the increasing prevalence of chronic kidney disease (CKD) and the fact that depression is a common comorbidity among patients with CKD, especially those who require dialysis[69,70]. Furthermore, there is growing awareness among healthcare professionals of the impact that depression can have on the overall health and well-being of dialysis patients, as well as a greater emphasis on addressing mental health issues as part of comprehensive care[71,72]. As a result, it is reasonable to anticipate that research on this subject will continue to grow in the coming years.

Research studies to identify nations with a significant presence in a specific research discipline. In this case, the USA was determined to have the most influential research on depression and dialysis. This conclusion was likely reached by analyzing the number of publications and citations in these disciplines from various countries. It is not uncommon for countries to excel in particular areas of research while lagging behind in others[73-76]. Variables such as financial resources, government support, academic infrastructure, and cultural attitudes toward research contribute to scientific productivity. Countries such as Turkey, Iran and Brazil may have devoted more resources to depression and dialysis research, resulting in an increase in the number of publications. Additionally, these countries may have research questions or perspectives that have not been investigated as extensively in other regions. Notably, the connection between economic development and scientific productivity is intricate. Although it is true that countries with larger economies typically have more resources for research, there are numerous instances in which smaller or developing countries make significant scientific contributions. However, it is essential to note that research output does not necessarily equate to quality or influence. Other factors, such as funding, collaboration, and the caliber of research institutions, can also affect a country's research influence[77]. It is also possible that other countries conduct high-quality research in these fields but are not recognized due to language barriers or lack of visibility[78].

The main themes of a research paper are usually reflected in the title and abstracts. When the terms depression and dialysis occur together frequently in a research field, it indicates current trends and progress in that area. Based on this cooccurrence, research on depression and dialysis can be categorized into three aspects: (1) "Prevalence of depression and anxiety among dialysis patients and gender differences"; (2) "Identification of depression as a potential risk factor for poor outcomes in dialysis patients"; and (3) "Effective interventions for alleviating depression in dialysis patients".

The prevalence of depression and anxiety among dialysis patients, as well as gender differences, was one of the most important aspects of the study. There are gender differences in the prevalence and presentation of depression and anxiety in this population[79,80]. According to previous studies, women on dialysis are more likely to experience depression and anxiety than men[79-81]. Several factors, including fluctuations in hormones, social roles and cultural norms, might contribute to this[4,82].

Figure 4 Map of a network visualization analysis of terms in titles and abstracts based on their frequency of appearance. Blue indicates earlier occurrences of the terms, whereas yellow indicates later occurrences. VOSviewer software version 1.6.19 was utilized to create the map.

The second hot topic was the "identification of depression as a potential risk factor for poor outcomes in dialysis patients". According to previous findings, depression in hemodynamic patients is associated with a decline in the quality of life, an increase in mortality and an increase in healthcare costs[11,83-86]. Depression may also be linked to poor adherence to medicine and diet plans, a higher number of hospitalizations and a lack of social support[87]. Healthcare practitioners must be aware of the likelihood of depression in hemodynamic patients and perform routine screenings. Antidepressant drugs, psychotherapy and lifestyle changes can all be used to treat depression in patients[88,89]. Correctly diagnosing and treating depression in these patients can improve both their mental and physical health[88].

The third hot topic was "effective therapies to relieve depression in dialysis patients". Enhancing the quality of life and health outcomes of dialysis patients involves the deployment of depression-fighting therapies[90,91]. Various therapies have been found to be useful for lowering depression in dialysis patients experiencing hemodynamic lysis[19,92,93]. One of the most widely utilized therapies is antidepressant medication. Antidepressant medication has been proven in various studies to be beneficial for reducing depressive symptoms in dialysis patients, as well as for improving other aspects of their health, such as sleep quality and pain management[94,95]. Cognitive behavioral therapy (CBT) is a successful treatment for depression in dialysis patients. CBT is a type of therapy that aims to change negative thought and behavior patterns[96-98]. Several studies have indicated that CBT can considerably reduce depressive symptoms and enhance dialysis patients' quality of life[96,97]. In addition to CBT, exercise, music therapy and mindfulness-based therapies have been demonstrated to be helpful for treating depression in patients[92,99,100]. It has been shown that exercise enhances mood and reduces depressive symptoms in dialysis patients, whereas music therapy and mindfulness-based interventions may be helpful in the management of stress and anxiety.

Most research publications that involved dialysis patients before 2014 focused on the prevalence and gender differences of depression and anxiety and the identification of depression as a risk factor for negative outcomes in those patients. However, a marked change in research trends has been undertaken since 2014. The emphasis has shifted to focus on effective interventions that improve depression in dialysis patients. Thus, the research has acknowledged the value of addressing the practical elements in managing depression and improving the well-being of patients undergoing dialysis. The following future directions in this field are based on these findings. Although this issue to explore gender differences in the prevalence of depression and anxiety among patients undergoing dialysis was prevalent before 2014, further research may be needed for a deeper understanding of the factors that contribute to gender differences and their effects on treatment and outcome. Previous research has focused mainly on studying the correlation between depression and adverse outcomes, but it is necessary to continue to evaluate the relationship and understand the underlying mechanism of depression's impact on the well-being of patients treated with dialysis. Recent articles focus primarily on methods to help people with depression. In the future, researchers should study various treatments such as medication therapies and social support to determine the most effective methods for alleviating depression in these patients.

Research is needed to investigate the psychological and social factors causing depression and anxiety in patients who require dialysis. This involves assessing factors such as economic difficulties, stress management strategies, the presence of strong support systems and other relevant factors that can influence the development and deterioration of depression in this particular patient group. It is essential to acknowledge the lasting effects of therapeutic interventions on the mental and overall health of dialysis patients. By conducting long-term studies and follow-up evaluations, we can gain valuable information regarding the long-term efficacy and sustainability of various treatment approaches.

By utilizing bibliometrics, this study took a novel approach to understanding the academic literature on the relationship between dialysis and depression. Researchers could easily identify study participants, focal areas of interest and emerging patterns within this specific domain by utilizing visual analysis. Although these methods were useful in identifying research trends and knowledge gaps, they did have some limitations. Firstly, there was a potential risk of bias in the selection of publications and the inability to capture the full complexity of research topics. This was mainly due to our search being limited to Scopus, which, although comprehensive and reputable for numerous academic fields, might have omitted papers from alternative sources such as PubMed and Web of Science. Secondly, the list of keywords used in the study was derived from previous literature reviews and it is possible that some keywords were omitted, resulting in false-negative findings. Thirdly, as the citation searches were time dependent, older articles were more likely to be cited, which may have influenced the study findings. Fourthly, the scope of the investigation was limited to the search for the title and specific search phrases related to dialysis and depression, which may have led to the omission of relevant articles that used different terms. Lastly, the limitations of the Scopus database resulted in the dispersion of research output from active institutions with multiple Scopus profiles and the omission of funding agency names due to variations in publication naming conventions. Therefore, it is essential to refrain from manipulating or merging the Scopus output and to restrict data analysis to the specified method.

CONCLUSION

This study investigated the growth, trends and research topics associated with depression in dialysis patients. Analysis of 800 documents published between 1970 and 2022 revealed a significant increase in research activity over the past two decades, emphasizing the significance of addressing this common psychological condition in dialysis patients. In addition to the USA as the main contributor, Turkey, China and Iran have also made substantial contributions to the field. The study identifies key research areas and three major clusters of findings: gender differences in depression distribution; depression as a risk factor; and effective depression treatments. These findings contribute to the knowledge concerning gender-specific depression in dialysis patients and the development of effective strategies to improve their mental health. In addition, this report proposes future research directions, given the increasing emphasis on effective treatments for depression in dialysis patients. The study highlighted the growing awareness of the influence of depression on treatment adherence and health outcomes in this population. This study contributed to the advancement of knowledge in its field by indicating the way forward for future research on depression treatments for dialysis patients.

ACKNOWLEDGMENTS

ARTICLE HIGHLIGHTS

Research background

Depression is a prevalent psychiatric disorder among patients with end-stage renal disease. Hemodialysis patients have a significantly higher occurrence of depression than the general population. Similar to other chronic illnesses and the overall population, research indicates that depression in hemodialysis patients is linked to a diminished quality of life and heightened mortality.

Research motivation

To identify knowledge gaps and guide future research directions, it is crucial to comprehend the present status of research and areas of focus within the domains of depression and hemodialysis.

Research objectives

The objective of the research was to offer a comprehensive analysis of the existing research in the area of depression and hemodialysis through bibliometric analysis.

Research methods

A search was performed in the Scopus database to find publications on the topic of dialysis and depression from 1970 to

2022. The acquired data underwent bibliometric analysis utilizing VOSviewer software version 1.6.9. This analysis encompassed visualization, co-occurrence, and examination of publication patterns in the field of dialysis and depression.

Research results

The number of publications addressing the correlation between dialysis and depression has increased substantially over the past 20 years. Prior to 2002, the yearly publication count was below three. Nonetheless, starting from 2013, there has been a remarkable acceleration in the publication rate, surpassing 46 articles per year, specifically focusing on dialysis and depression.

Research conclusions

Three significant research topics have emerged, focusing on the varying occurrence of depression and anxiety based on gender, recognizing depression as a contributing factor to negative consequences, and assessing the effectiveness of therapies in reducing depression among individuals undergoing dialysis.

Research perspectives

The objective of this study was to determine present patterns and focal points in the domain of dialysis and depression. This will aid in directing future research and updating clinical practices. Through the utilization of bibliometric analysis, the study offers a thorough summary of the literature concerning this subject matter. Consequently, it facilitates researchers and clinicians in keeping abreast of the most recent advancements in the field.

FOOTNOTES

REFERENCES

1　**Shin SJ**, Lee JH. Hemodialysis as a life-sustaining treatment at the end of life. *Kidney Res Clin Pract* 2018; **37**: 112-118 [PMID: 29971206 DOI: 10.23876/j.krcp.2018.37.2.112]

2　**Himmelfarb J**, Vanholder R, Mehrotra R, Tonelli M. The current and future landscape of dialysis. *Nat Rev Nephrol* 2020; **16**: 573-585 [PMID: 32733095 DOI: 10.1038/s41581-020-0315-4]

3　**Finnegan-John J**, Thomas VJ. The psychosocial experience of patients with end-stage renal disease and its impact on quality of life: findings from a needs assessment to shape a service. *ISRN Nephrol* 2013; **2013**: 308986 [PMID: 24959536 DOI: 10.5402/2013/308986]

4　**Bello AK**, Okpechi IG, Osman MA, Cho Y, Htay H, Jha V, Wainstein M, Johnson DW. Epidemiology of haemodialysis outcomes. *Nat Rev Nephrol* 2022; **18**: 378-395 [PMID: 35194215 DOI: 10.1038/s41581-022-00542-7]

5　**King-Wing Ma T**, Kam-Tao Li P. Depression in dialysis patients. *Nephrology (Carlton)* 2016; **21**: 639-646 [PMID: 26860073 DOI: 10.1111/nep.12742]

6　**Kanter JW**, Busch AM, Weeks CE, Landes SJ. The nature of clinical depression: symptoms, syndromes, and behavior analysis. *Behav Anal* 2008; **31**: 1-21 [PMID: 22478499 DOI: 10.1007/BF03392158]

7　**Shirazian S**, Grant CD, Aina O, Mattana J, Khorassani F, Ricardo AC. Depression in Chronic Kidney Disease and End-Stage Renal Disease: Similarities and Differences in Diagnosis, Epidemiology, and Management. *Kidney Int Rep* 2017; **2**: 94-107 [PMID: 29318209 DOI: 10.1016/j.ekir.2016.09.005]

8　**Marthoenis M**, Syukri M, Abdullah A, Tandi TMR, Putra N, Laura H, Setiawan A, Sofyan H, Schouler-Ocak M. Quality of life, depression, and anxiety of patients undergoing hemodialysis: Significant role of acceptance of the illness. *Int J Psychiatry Med* 2021; **56**: 40-50 [PMID: 32216494 DOI: 10.1177/0091217420913382]

9   **Goh ZS**, Griva K. Anxiety and depression in patients with end-stage renal disease: impact and management challenges - a narrative review. *Int J Nephrol Renovasc Dis* 2018; **11**: 93-102 [PMID: 29559806 DOI: 10.2147/IJNRD.S126615]

10 **Gebrie MH**, Ford J. Depressive symptoms and dietary non-adherence among end stage renal disease patients undergoing hemodialysis therapy: systematic review. *BMC Nephrol* 2019; **20**: 429 [PMID: 31752741 DOI: 10.1186/s12882-019-1622-5]

11 **Drayer RA**, Piraino B, Reynolds CF 3rd, Houck PR, Mazumdar S, Bernardini J, Shear MK, Rollman BL. Characteristics of depression in hemodialysis patients: symptoms, quality of life and mortality risk. *Gen Hosp Psychiatry* 2006; **28**: 306-312 [PMID: 16814629 DOI: 10.1016/j.genhosppsych.2006.03.008]

12 **Mok MMY**, Liu CKM, Lam MF, Kwan LPY, Chan GCW, Ma MKM, Yap DYH, Chiu F, Choy CBY, Tang SCW, Chan TM. A Longitudinal Study on the Prevalence and Risk Factors for Depression and Anxiety, Quality of Life, and Clinical Outcomes in Incident Peritoneal Dialysis Patients. *Perit Dial Int* 2019; **39**: 74-82 [PMID: 29991560 DOI: 10.3747/pdi.2017.00168]

13 **Chiou CP**, Bai YL, Lai LY, Hsieh HC, Chang ST. Hierarchical multiple regression investigating factors associated with depressive symptoms in the middle-aged and elderly undergoing haemodialysis. *BMC Public Health* 2023; **23**: 237 [PMID: 36737709 DOI: 10.1186/s12889-023-15140-w]

14 **Duan D**, Yang L, Zhang M, Song X, Ren W. Depression and Associated Factors in Chinese Patients With Chronic Kidney Disease Without Dialysis: A Cross-Sectional Study. *Front Public Health* 2021; **9**: 605651 [PMID: 34123983 DOI: 10.3389/fpubh.2021.605651]

15 **Farragher JF**, Polatajko HJ, Jassal SV. The Relationship Between Fatigue and Depression in Adults With End-Stage Renal Disease on Chronic In-Hospital Hemodialysis: A Scoping Review. *J Pain Symptom Manage* 2017; **53**: 783-803.e1 [PMID: 28042060 DOI: 10.1016/j.jpainsymman.2016.10.365]

16 **Nah R**, Robertson N, Niyi-Odumosu FA, Clarke AL, Bishop NC, Smith AC. Relationships between illness representations, physical activity and depression in chronic kidney disease. *J Ren Care* 2019; **45**: 74-82 [PMID: 30938078 DOI: 10.1111/jorc.12274]

17 **Yavuz YC**, Biyik Z, Ozkul D, Abusoglu S, Eryavuz D, Dag M, Korez MK, Guney I, Altintepe L. Association of depressive symptoms with 25(OH) vitamin D in hemodialysis patients and effect of gender. *Clin Exp Nephrol* 2020; **24**: 63-72 [PMID: 31544220 DOI: 10.1007/s10157-019-01794-7]

18 **Ng CZ**, Tang SC, Chan M, Tran BX, Ho CS, Tam WW, Ho RC. A systematic review and meta-analysis of randomized controlled trials of cognitive behavioral therapy for hemodialysis patients with depression. *J Psychosom Res* 2019; **126**: 109834 [PMID: 31525637 DOI: 10.1016/j.jpsychores.2019.109834]

19 **Barello S**, Anderson G, Acampora M, Bosio C, Guida E, Irace V, Guastoni CM, Bertani B, Graffigna G. The effect of psychosocial interventions on depression, anxiety, and quality of life in hemodialysis patients: a systematic review and a meta-analysis. *Int Urol Nephrol* 2023; **55**: 897-912 [PMID: 36180655 DOI: 10.1007/s11255-022-03374-3]

20 **Ravaghi H**, Behzadifar M, Taheri Mirghaed M, Aryankhesal A, Salemi M, Bragazzi NL. Prevalence of Depression in Hemodialysis Patients in Iran: a Systematic Review and Meta-analysis. *Iran J Kidney Dis* 2017; **11**: 90-98 [PMID: 28270640]

21 **Song YY**, Hu RJ, Diao YS, Chen L, Jiang XL. Effects of Exercise Training on Restless Legs Syndrome, Depression, Sleep Quality, and Fatigue Among Hemodialysis Patients: A Systematic Review and Meta-analysis. *J Pain Symptom Manage* 2018; **55**: 1184-1195 [PMID: 29247753 DOI: 10.1016/j.jpainsymman.2017.12.472]

22 **Teles F**, Azevedo VF, Miranda CT, Miranda MP, Teixeira Mdo C, Elias RM. Depression in hemodialysis patients: the role of dialysis shift. *Clinics (Sao Paulo)* 2014; **69**: 198-202 [PMID: 24626947 DOI: 10.6061/clinics/2014(03)10]

23 **Elkheir HK**, Wagaella AS, Badi S, Khalil A, Elzubair TH, Ahmed MH. Prevalence and risk factors of depressive symptoms among dialysis patients with end-stage renal disease (ESRD) in Khartoum, Sudan: A cross-sectional study. *J Family Med Prim Care* 2020; **9**: 3639-3643 [PMID: 33102343 DOI: 10.4103/jfmpc.jfmpc_1229_19]

24 **Hicks D**, Melkers J.   Bibliometrics as a tool for research evaluation. 2013 [DOI: 10.4337/9780857932402.00019]

25 **Belter CW**. Bibliometric indicators: opportunities and limits. *J Med Libr Assoc* 2015; **103**: 219-221 [PMID: 26512227 DOI: 10.3163/1536-5050.103.4.014]

26 **Ellegaard O**, Wallin JA. The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics* 2015; **105**: 1809-1831 [PMID: 26594073 DOI: 10.1007/s11192-015-1645-z]

27 **Wallin JA**. Bibliometric methods: pitfalls and possibilities. *Basic Clin Pharmacol Toxicol* 2005; **97**: 261-275 [PMID: 16236137 DOI: 10.1111/j.1742-7843.2005.pto_139.x]

28 **Sweileh WM**. A bibliometric analysis of global research output on health and human rights (1900-2017). *Glob Health Res Policy* 2018; **3**: 30 [PMID: 30377667 DOI: 10.1186/s41256-018-0085-8]

29 **Sweileh WM**. Bibliometric analysis of peer-reviewed literature on climate change and human health with an emphasis on infectious diseases. *Global Health* 2020; **16**: 44 [PMID: 32384901 DOI: 10.1186/s12992-020-00576-1]

30 **Shakhshir M**, Abushanab AS, Koni A, Barqawi A, Demyati K, Al-Jabi SW, Zyoud SH. Mapping the global research landscape on nutritional support for patients with gastrointestinal malignancy: visualization analysis. *Support Care Cancer* 2023; **31**: 179 [PMID: 36810807 DOI: 10.1007/s00520-023-07645-2]

31 **Zyoud SH**. The Arab region's contribution to global COVID-19 research: Bibliometric and visualization analysis. *Global Health* 2021; **17**: 31 [PMID: 33766073 DOI: 10.1186/s12992-021-00690-8]

32 **Zyoud SH**. Global research on Clostridium difficile-associated diarrhoea: A visualized study. *World J Gastroenterol* 2022; **28**: 3720-3731 [PMID: 36161039 DOI: 10.3748/wjg.v28.i28.3720]

33 **Gou Y**, Fu Y, Li Y, Liu C. Research of targeted therapy for renal cancer from 2006 to 2022: a bibliometric and visualized analysis. *Transl Androl Urol* 2023; **12**: 455-465 [PMID: 37032755 DOI: 10.21037/tau-23-128]

34 **Wang C**, Jiang Z, Pang R, Zhang H, Li H, Li Z. Global trends in research of achilles tendon injury/rupture: A bibliometric analysis, 2000-2021. *Front Surg* 2023; **10**: 1051429 [PMID: 37051567 DOI: 10.3389/fsurg.2023.1051429]

35 **Yang Z**, Ma Y, Bi W, Tang J. Exploring the research landscape of COVID-19-induced olfactory dysfunction: A bibliometric study. *Front Neurosci* 2023; **17**: 1164901 [PMID: 37034158 DOI: 10.3389/fnins.2023.1164901]

36 **AlRyalat SAS**, Malkawi LW, Momani SM. Comparing Bibliometric Analysis Using PubMed, Scopus, and Web of Science Databases. *J Vis Exp* 2019 [PMID: 31710021 DOI: 10.3791/58494]

37 **Anker MS**, Hadzibegovic S, Lena A, Haverkamp W. The difference in referencing in Web of Science, Scopus, and Google Scholar. *ESC Heart Fail* 2019; **6**: 1291-1312 [PMID: 31886636 DOI: 10.1002/ehf2.12583]

38 **Bakkalbasi N**, Bauer K, Glover J, Wang L. Three options for citation tracking: Google Scholar, Scopus and Web of Science. *Biomed Digit Libr* 2006; **3**: 7 [PMID: 16805916 DOI: 10.1186/1742-5581-3-7]

39   **Falagas ME**, Pitsouni EI, Malietzis GA, Pappas G. Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *FASEB J* 2008; **22**: 338-342 [PMID: 17884971 DOI: 10.1096/fj.07-9492LSF]

40   **Kulkarni AV**, Aziz B, Shams I, Busse JW. Comparisons of citations in Web of Science, Scopus, and Google Scholar for articles published in general medical journals. *JAMA* 2009; **302**: 1092-1096 [PMID: 19738094 DOI: 10.1001/jama.2009.1307]

41   **Sweileh WM**. Global research activity on antimicrobial resistance in food-producing animals. *Arch Public Health* 2021; **79**: 49 [PMID: 33849636 DOI: 10.1186/s13690-021-00572-w]

42   **Sweileh WM**. Bibliometric analysis of peer-reviewed literature on antimicrobial stewardship from 1990 to 2019. *Global Health* 2021; **17**: 1 [PMID: 33397377 DOI: 10.1186/s12992-020-00651-7]

43   **Sweileh WM**. Health-related publications on people living in fragile states in the alert zone: a bibliometric analysis. *Int J Ment Health Syst* 2020; **14**: 70 [PMID: 32868982 DOI: 10.1186/s13033-020-00402-6]

44   **Sweileh WM**. Global research publications on systemic use of off-label and unlicensed drugs: A bibliometric analysis (1990-2020). *Int J Risk Saf Med* 2022; **33**: 77-89 [PMID: 34275912 DOI: 10.3233/JRS-210012]

45   **Sweileh WM**. Global Research Activity on Elder Abuse: A Bibliometric Analysis (1950-2017). *J Immigr Minor Health* 2021; **23**: 79-87 [PMID: 32488667 DOI: 10.1007/s10903-020-01034-1]

46   **Karasneh RA**, Al-Azzam SI, Alzoubi KH, Hawamdeh SS, Sweileh WM. Global Research Trends of Health-Related Publications on Ramadan Fasting from 1999 to 2021: A Bibliometric Analysis. *J Relig Health* 2022; **61**: 3777-3794 [PMID: 35524937 DOI: 10.1007/s10943-022-01573-x]

47   **Sweileh WM**. Analysis and mapping of global research publications on shift work (2012-2021). *J Occup Med Toxicol* 2022; **17**: 22 [PMID: 36514070 DOI: 10.1186/s12995-022-00364-0]

48   **Sweileh WM**. Contribution of researchers in Arab countries to scientific publications on neglected tropical diseases (1971 - 2020). *Trop Dis Travel Med Vaccines* 2022; **8**: 14 [PMID: 35650654 DOI: 10.1186/s40794-022-00173-7]

49   **Shakhshir M**, Zyoud SH. Global research trends on diet and nutrition in Crohn's disease. *World J Gastroenterol* 2023; **29**: 3203-3215 [PMID: 37346151 DOI: 10.3748/wjg.v29.i20.3203]

50   **Zyoud SH**. The state of current research on COVID-19 and antibiotic use: global implications for antimicrobial resistance. *J Health Popul Nutr* 2023; **42**: 42 [PMID: 37173756 DOI: 10.1186/s41043-023-00386-2]

51   **Simpson PL**, Scicluna HA, Jones PD, Cole AM, O'Sullivan AJ, Harris PG, Velan G, McNeil HP. Predictive validity of a new integrated selection process for medical school admission. *BMC Med Educ* 2014; **14**: 86 [PMID: 24755325 DOI: 10.1186/1472-6920-14-86]

52   **Hirsch JE**. An index to quantify an individual's scientific research output. *Proc Natl Acad Sci U S A* 2005; **102**: 16569-16572 [PMID: 16275915 DOI: 10.1073/pnas.0507655102]

53   **Wang JL**, Ma YJ, Ma L, Ma N, Guo DM, Ma LS. Baishideng's Reference Citation Analysis database announces the first Article Influence Index of multidisciplinary scholars. *World J Clin Cases* 2022; **10**: 10391-10398 [PMID: 36312463 DOI: 10.12998/wjcc.v10.i29.10391]

54   **Wang JL**, Ma YJ, Ma L, Ma N, Guo DM, Ma LS. Baishideng's Reference Citation Analysis database announces the first Journal Article Influence Index of 101 core journals and a list of high-quality academic journals in gastroenterology and hepatology. *World J Gastroenterol* 2022; **28**: 5383-5394 [PMID: 36312837 DOI: 10.3748/wjg.v28.i37.5383]

55   **Wang JL**, Ma YJ, Ma L, Ma N, Guo DM, Ma LS. Baishideng's Reference Citation Analysis database announces the first Journal Article Influence Index of 104 core journals and a list of high-quality academic journals in orthopedics. *World J Orthop* 2022; **13**: 891-902 [PMID: 36312521 DOI: 10.5312/wjo.v13.i10.891]

56   **van Eck NJ**, Waltman L.   Text mining and visualization using VOSviewer. 2011 Preprint. Available from: arXiv:11092058 [DOI: 10.48550/arXiv.1109.2058]

57   **van Eck NJ**, Waltman L.   VOSviewer manual. Leiden: Univeristeit Leiden. 2013

58   **van Eck NJ**, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 2010; **84**: 523-538 [PMID: 20585380 DOI: 10.1007/s11192-009-0146-3]

59   **Craven JL**, Rodin GM, Littlefield C. The Beck Depression Inventory as a screening device for major depression in renal dialysis patients. *Int J Psychiatry Med* 1988; **18**: 365-374 [PMID: 3235282 DOI: 10.2190/m1tx-v1ej-e43l-rklf]

60   **Finkelstein FO**, Finkelstein SH. Depression in chronic dialysis patients: assessment and treatment. *Nephrol Dial Transplant* 2000; **15**: 1911-1913 [PMID: 11096130 DOI: 10.1093/ndt/15.12.1911]

61   **Hedayati SS**, Bosworth HB, Kuchibhatla M, Kimmel PL, Szczech LA. The predictive value of self-report scales compared with physician diagnosis of depression in hemodialysis patients. *Kidney Int* 2006; **69**: 1662-1668 [PMID: 16598203 DOI: 10.1038/sj.ki.5000308]

62   **Kimmel PL**, Peterson RA. Depression in end-stage renal disease patients treated with hemodialysis: tools, correlates, outcomes, and needs. *Semin Dial* 2005; **18**: 91-97 [PMID: 15771651 DOI: 10.1111/j.1525-139X.2005.18209.x]

63   **Kimmel PL**, Peterson RA, Weihs KL, Simmens SJ, Alleyne S, Cruz I, Veis JH. Multiple measurements of depression predict mortality in a longitudinal study of chronic hemodialysis outpatients. *Kidney Int* 2000; **57**: 2093-2098 [PMID: 10792629 DOI: 10.1046/j.1523-1755.2000.00059.x]

64   **Kimmel PL**, Weihs K, Peterson RA. Survival in hemodialysis patients: the role of depression. *J Am Soc Nephrol* 1993; **4**: 12-27 [PMID: 8400064 DOI: 10.1681/ASN.V4112]

65   **Lopes AA**, Albert JM, Young EW, Satayathum S, Pisoni RL, Andreucci VE, Mapes DL, Mason NA, Fukuhara S, Wikström B, Saito A, Port FK. Screening for depression in hemodialysis patients: associations with diagnosis, treatment, and outcomes in the DOPPS. *Kidney Int* 2004; **66**: 2047-2053 [PMID: 15496178 DOI: 10.1111/j.1523-1755.2004.00977.x]

66   **Lopes AA**, Bragg J, Young E, Goodkin D, Mapes D, Combe C, Piera L, Held P, Gillespie B, Port FK; Dialysis Outcomes and Practice Patterns Study (DOPPS). Depression as a predictor of mortality and hospitalization among hemodialysis patients in the United States and Europe. *Kidney Int* 2002; **62**: 199-207 [PMID: 12081579 DOI: 10.1046/j.1523-1755.2002.00411.x]

67   **Watnick S**, Kirwin P, Mahnensmith R, Concato J. The prevalence and treatment of depression among patients starting dialysis. *Am J Kidney Dis* 2003; **41**: 105-110 [PMID: 12500227 DOI: 10.1053/ajkd.2003.50029]

68   **Watnick S**, Wang PL, Demadura T, Ganzini L. Validation of 2 depression screening tools in dialysis patients. *Am J Kidney Dis* 2005; **46**: 919-924 [PMID: 16253733 DOI: 10.1053/j.ajkd.2005.08.006]

69   **Gupta S**, Patil NM, Karishetti M, Tekkalaki BV. Prevalence and clinical correlates of depression in chronic kidney disease patients in a tertiary care hospital. *Indian J Psychiatry* 2018; **60**: 485-488 [PMID: 30581215 DOI: 10.4103/psychiatry.IndianJPsychiatry_272_18]

70   **Bautovich A**, Katz I, Smith M, Loo CK, Harvey SB. Depression and chronic kidney disease: A review for clinicians. *Aust N Z J Psychiatry*

2014; **48**: 530-541 [PMID: 24658294 DOI: 10.1177/0004867414528589]

71   **Fernandez L**, Thompson S, Berendonk C, Schick-Makaroff K. Mental Health Care for Adults Treated With Dialysis in Canada: A Scoping Review. *Can J Kidney Health Dis* 2022; **9**: 20543581221086328 [PMID: 35340771 DOI: 10.1177/20543581221086328]

72   **Carswell C**, Cogley C, Bramham K, Chilcot J, Noble H, Siddiqi N. Chronic kidney disease and severe mental illness: a scoping review. *J Nephrol* 2023 [PMID: 37029882 DOI: 10.1007/s40620-023-01599-8]

73   **Zyoud SH**, Al-Jabi SW, Koni A, Shakhshir M, Shahwan M, Jairoun AA. Mapping the landscape and structure of global research on nutrition and COVID-19: visualization analysis. *J Health Popul Nutr* 2022; **41**: 25 [PMID: 35689295 DOI: 10.1186/s41043-022-00304-y]

74   **Zyoud SH**, Al-Jabi SW, Amer R, Shakhshir M, Shahwan M, Jairoun AA, Akkawi M, Abu Taha A. Global research trends on the links between the gut microbiome and cancer: a visualization analysis. *J Transl Med* 2022; **20**: 83 [PMID: 35148757 DOI: 10.1186/s12967-022-03293-y]

75   **Sweileh WM**, Shraim NY, Al-Jabi SW, Sawalha AF, Rahhal B, Khayyat RA, Zyoud SH. Assessing worldwide research activity on probiotics in pediatrics using Scopus database: 1994-2014. *World Allergy Organ J* 2016; **9**: 25 [PMID: 27504147 DOI: 10.1186/s40413-016-0116-1]

76   **Zyoud SH**, Shakhshir M, Abushanab AS, Al-Jabi SW, Koni A, Shahwan M, Jairoun AA, Abu Taha A. Mapping the global research landscape on nutrition and the gut microbiota: Visualization and bibliometric analysis. *World J Gastroenterol* 2022; **28**: 2981-2993 [PMID: 35978868 DOI: 10.3748/wjg.v28.i25.2981]

77   **Ubfal D**, Maffioli A. The impact of funding on research collaboration: Evidence from a developing country. *RP* 2011; **40**: 1269-1279 [DOI: 10.1016/j.respol.2011.05.023]

78   **Amano T**, González-Varo JP, Sutherland WJ. Languages Are Still a Major Barrier to Global Science. *PLoS Biol* 2016; **14**: e2000933 [PMID: 28033326 DOI: 10.1371/journal.pbio.2000933]

79   **Um-E-Kalsoom**. Gender role in anxiety, depression and quality of life in chronic kidney disease patients. *Pak J Med Sci* 2020; **36**: 251-254 [PMID: 32063969 DOI: 10.12669/pjms.36.2.869]

80   **Mosleh H**, Alenezi M, Al Johani S, Alsani A, Fairaq G, Bedaiwi R. Prevalence and Factors of Anxiety and Depression in Chronic Kidney Disease Patients Undergoing Hemodialysis: A Cross-sectional Single-Center Study in Saudi Arabia. *Cureus* 2020; **12**: e6668 [PMID: 31976185 DOI: 10.7759/cureus.6668]

81   **Nagy E**, Tharwat S, Elsayed AM, Shabaka SAE, Nassar MK. Anxiety and depression in maintenance hemodialysis patients: prevalence and their effects on health-related quality of life. *Int Urol Nephrol* 2023 [DOI: 10.1007/s11255-023-03556-7]

82   **Gerogianni G**, Polikandrioti M, Babatsikou F, Zyga S, Alikari V, Vasilopoulos G, Gerogianni S, Grapsa E. Anxiety-Depression of Dialysis Patients and Their Caregivers. *Medicina (Kaunas)* 2019; **55** [PMID: 31137563 DOI: 10.3390/medicina55050168]

83   **Chan L**, Tummalapalli SL, Ferrandino R, Poojary P, Saha A, Chauhan K, Nadkarni GN. The Effect of Depression in Chronic Hemodialysis Patients on Inpatient Hospitalization Outcomes. *Blood Purif* 2017; **43**: 226-234 [PMID: 28114133 DOI: 10.1159/000452750]

84   **Anderson BM**, Qasim M, Correa G, Evison F, Gallier S, Ferro CJ, Jackson TA, Sharif A. Depression is associated with frailty and lower quality of life in haemodialysis recipients, but not with mortality or hospitalization. *Clin Kidney J* 2023; **16**: 342-354 [PMID: 36755846 DOI: 10.1093/ckj/sfac241]

85   **Farrokhi F**, Abedi N, Beyene J, Kurdyak P, Jassal SV. Association between depression and mortality in patients receiving long-term dialysis: a systematic review and meta-analysis. *Am J Kidney Dis* 2014; **63**: 623-635 [PMID: 24183836 DOI: 10.1053/j.ajkd.2013.08.024]

86   **Hedayati SS**, Minhajuddin AT, Afshar M, Toto RD, Trivedi MH, Rush AJ. Association between major depressive episodes in patients with chronic kidney disease and initiation of dialysis, hospitalization, or death. *JAMA* 2010; **303**: 1946-1953 [PMID: 20483971 DOI: 10.1001/jama.2010.619]

87   **Goldstein CM**, Gathright EC, Garcia S. Relationship between depression and medication adherence in cardiovascular disease: the perfect challenge for the integrated care team. *Patient Prefer Adherence* 2017; **11**: 547-559 [PMID: 28352161 DOI: 10.2147/PPA.S127277]

88   **Katon WJ**. Epidemiology and treatment of depression in patients with chronic medical illness. *Dialogues Clin Neurosci* 2011; **13**: 7-23 [PMID: 21485743 DOI: 10.31887/DCNS.2011.13.1/wkaton]

89   **Nadort E**, Schouten RW, Witte SHS, Broekman BFP, Honig A, Siegert CEH, van Oppen P. Treatment of current depressive symptoms in dialysis patients: A systematic review and meta-analysis. *Gen Hosp Psychiatry* 2020; **67**: 26-34 [PMID: 32919306 DOI: 10.1016/j.genhosppsych.2020.07.012]

90   **Xing L**, Chen R, Diao Y, Qian J, You C, Jiang X. Do psychological interventions reduce depression in hemodialysis patients?: A meta-analysis of randomized controlled trials following PRISMA. *Medicine (Baltimore)* 2016; **95**: e4675 [PMID: 27559971 DOI: 10.1097/MD.0000000000004675]

91   **Mahjubian A**, Bahraminejad N, Kamali K. The Effects of Group Discussion Based Education on the Promotion of Self-Management Behaviors in Hemodialysis Patients. *J Caring Sci* 2018; **7**: 225-232 [PMID: 30607364 DOI: 10.15171/jcs.2018.034]

92   **Natale P**, Palmer SC, Ruospo M, Saglimbene VM, Rabindranath KS, Strippoli GF. Psychosocial interventions for preventing and treating depression in dialysis patients. *Cochrane Database Syst Rev* 2019; **12**: CD004542 [PMID: 31789430 DOI: 10.1002/14651858.CD004542.pub3]

93   **Cukor D**, Ver Halen N, Asher DR, Coplan JD, Weedon J, Wyka KE, Saggi SJ, Kimmel PL. Psychosocial intervention improves depression, quality of life, and fluid adherence in hemodialysis. *J Am Soc Nephrol* 2014; **25**: 196-206 [PMID: 24115478 DOI: 10.1681/ASN.2012111134]

94   **Hedayati SS**, Yalamanchili V, Finkelstein FO. A practical approach to the treatment of depression in patients with chronic kidney disease and end-stage renal disease. *Kidney Int* 2012; **81**: 247-255 [PMID: 22012131 DOI: 10.1038/ki.2011.358]

95   **Kubanek A**, Paul P, Przybylak M, Kanclerz K, Rojek JJ, Renke M, Bidzan L, Grabowski J. Use of Sertraline in Hemodialysis Patients. *Medicina (Kaunas)* 2021; **57** [PMID: 34577872 DOI: 10.3390/medicina57090949]

96   **Zegarow P**, Manczak M, Rysz J, Olszewski R. The influence of cognitive-behavioral therapy on depression in dialysis patients - meta-analysis. *Arch Med Sci* 2020; **16**: 1271-1278 [PMID: 33224325 DOI: 10.5114/aoms.2019.88019]

97   **Valsaraj BP**, Bhat SM, Latha KS. Cognitive Behaviour Therapy for Anxiety and Depression among People Undergoing Haemodialysis: A Randomized Control Trial. *J Clin Diagn Res* 2016; **10**: VC06-VC10 [PMID: 27656536 DOI: 10.7860/JCDR/2016/18959.8383]

98   **Duarte PS**, Miyazaki MC, Blay SL, Sesso R. Cognitive-behavioral group therapy is an effective treatment for major depression in hemodialysis patients. *Kidney Int* 2009; **76**: 414-421 [PMID: 19455196 DOI: 10.1038/ki.2009.156]

99   **Imani M**, Jalali A, Salari N, Abbasi P. Effect of instrumental music on anxiety and depression among hemodialysis patients: A randomized controlled trial. *J Educ Health Promot* 2021; **10**: 305 [PMID: 34667805 DOI: 10.4103/jehp.jehp_1472_20]

100   **Nassim M**, Park H, Dikaios E, Potes A, Elbaz S, Mc Veigh C, Lipman M, Novak M, Trinh E, Alam A, Suri RS, Thomas Z, Torres-Platas S, Vasudev A, Sasi N, Gautier M, Mucsi I, Noble H, Rej S. Brief Mindfulness Intervention vs. Health Enhancement Program for Patients Undergoing Dialysis: A Randomized Controlled Trial. *Healthcare (Basel)* 2021; **9** [PMID: 34205915 DOI: 10.3390/healthcare9060659]

Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: bpgoffice@wjgnet.com
Help Desk: https://www.f6publishing.com/helpdesk
https://www.wjgnet.com