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

Al-Jabi SW. Dialysis and depressive disorders

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 results show that the number of publications related to dialysis and depression has increased significantly in the past two decades. The United States is leading the way with an impressive 144 publications, which is a staggering 18% of all publications on this topic. Turkey comes 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 to identify gaps in the literature and develop future research.

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

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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 United States has been heading 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 Scopus' daily updates, the documents for this study were retrieved and saved on April 12, 2023. The majority of bibliometric studies employ Scopus^[28-31] 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: 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 (extraorporeal therapy) OR TITLE (Hemofiltration) OR TITLE (hemodiafiltration) OR TITLE (hemoperfusion) OR TITLE ("continuous renal replacement therapy"). 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")). 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. 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 twenty most active researchers. This test found a strong correlation ($r = 0.960$) and a statistically 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 Inc., located in Pleasanton, CA 94566, United States^[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 colour to each cluster, which can be used to identify and analyse 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.

RESULTS

Evolution and growth of publications

We identified 800 publications that met the search criteria between the years 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.

Top active countries

In fact, 93 countries have contributed to the literature on dialysis and depression, according to Scopus. The United States is leading the way with an impressive 144 publications, which is a staggering 18% of all publications on this topic; Turkey comes second with 88 publications (11%), followed by China with 55 publications (6.88%) and Iran with 52 publications (6.5%) (see Table 1). Figure 2 depicts the countries with more than 10 publications on dialysis and depression, highlighting their collaboration 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 United States and Turkey contributing the most publications to the purple cluster.

Contributed institutions

According to Table 2, the top 10 institutions in the study generated a total of 89 publications, representing 11.13% of all the analysed 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. ¹ 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%).

Contributed 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* holds the highest number of publications with 24 articles, 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 more than 205 citations and were among the top 10. ² 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 colours. 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 is significantly associated with terms from other clusters. Overall, the three clusters are presented in Figure 3.

Future research direction analysis

In Figure 4, VOSviewer assigned distinct colours 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, revolve 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 United States, 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 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 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 United States 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 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].

The second hot topic is the 'identification of depression as a potential risk factor for poor outcomes in dialysis patients'. According to previous findings, depression in haemodynamic 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 haemodynamic 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 haemodynamic 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 behaviour 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.

Strengths and limitations

By utilizing bibliometrics, this study takes a novel approach to understanding the academic literature on the relationship between dialysis and depression. Researchers can easily identify study participants, focal areas of interest and emerging patterns within this specific domain by utilizing visual analysis. Although these methods have utility in identifying research trends and knowledge gaps, they do possess certain limitations. Firstly, there is a potential risk of bias in the selection of publications and the inability to capture the full complexity of research topics. This is mainly due to our search being limited to the Scopus database, 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 citation searches are time dependent, older articles are 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 can result 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 investigates the growth, trends and research topics associated with depression in dialysis patients. Analysis of 800 documents published between 1970 and 2022 reveals 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 United States 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. Furthermore, the study highlights the growing awareness of the influence of depression on treatment adherence and health outcomes in this population. This study contributes to the

advancement of knowledge in its field by indicating the way forward for future research on depression treatments for dialysis patients.

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 is 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. Afterward, the acquired data underwent bibliometric analysis utilizing VOSviewer software version 1.6.9. This analysis encompassed visualization, cooccurrence, and examination of publication patterns in the field of dialysis and depression.

Research results

The quantity of publications addressing the correlation between dialysis and depression has experienced a substantial rise over the past twenty years. Prior to 2002, the yearly publication count was below three articles. 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 is 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.

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