Global Recent Trends Research of Herbal Medicine for Diabetes Mellitus in a Decade (2014-2023): A Bibliometric Analysis and Scientific Mapping

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Abstract: Diabetes mellitus (DM) is a prevalent health issue on a global scale, characterized by the presence of persistent hyperglycemia due to compromised insulin synthesis, usage, or both. Oral antidiabetic medications and insulin have been the mainstay of diabetes treatment. A increasing body of research suggests that herbal therapies may enhance or even replace diabetes medications. Objective: The objective of this study is to find and assess diabetes-related herbal medicine research. This study examines publication patterns, renowned authors, scientific publications, research contributions' geographical distribution and the important research topics. Scopus was used to find herb research for DM papers. Use the database's "Search document" functionality to collect basic publication and citation information, including title, abstract, and key functions. The full bibliographic data was imported to Vosviewer for analysis. To illustrate title and abstract ideas and notions, visualization maps were created. Based on a decade-long dataset spanning from 2014 to 2023, this study reveals that there were 3,226 publications. The findings indicate that the growth and development of herbs for DM experienced a notable increase. The Journal of Ethnopharmacology, with 241 scholarly articles, is a leading herbal medication for DM journal. China leads the world in herbal diabetes research with 574 papers. With 18 articles, G. Zengin is the most prolific author in this field. The co-occurrence classification of herbs for DM field development map yields six clusters. Diabetes mellitus, antioxidants, and herbal therapy dominate the network. The bibliometric data shows that herbal diabetic treatments are becoming more popular. The use of natural diabetic therapies is expected to change. Herbal medicine research is growing and becoming more accessible.

1 INTRODUCTION

Diabetes mellitus is a pressing issue in worldwide health, characterized by a rising prevalence and consequential mortality (Lin et al., 2020; Robert & Dawish, 2020). The prevalence of diabetes mellitus has escalated to epidemic proportions, presenting substantial obstacles to global public health systems (Fang et al., 2022). Research findings have indicated a concerning rise in the occurrence of diabetes mellitus, observed in both industrialized and developing nations (Katulanda & Sheriff, 2009) (Abebe et al., 2014). The impact of diabetes mellitus goes beyond death, since it is also associated with decreased life expectancy and heightened susceptibility to complications (Lin et al., 2020). A comprehensive comprehension of the patterns in diabetes mellitus is of utmost importance in order to facilitate efficient strategies for prevention,

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treatment, and distribution of healthcare resources (Campbell & Shokrani, 2016).

Traditional medicinal plants have been recognized and utilized for the treatment and management of diabetes mellitus (Gaonkar & Hullatti, 2020). For thousands of years, herbs such as fenugreek and rhubarb have been used in various traditional medical systems to treat diabetes mellitus (Alsanad et al., 2018; Shad & Haghighi, 2018). These medicinal plants contain active components that have shown potential in regulating blood glucose levels and gene expression related to diabetes (Salehi et al., 2019). Additionally, the use of herbal remedies for diabetes mellitus is prevalent among patients, who often turn to these alternatives due to the challenges of adhering to conventional therapeutic regimens (Mekuria et al., 2018). Medicinal plants provide a hopeful opportunity for the creation of novel orally effective substances for treating diabetes mellitus (Farzaei et al., 2017; Akram, 2013).

2 METHODS

2.1 Data Collection

Scopus, being the preeminent and extensive scientific database presently accessible, provides a diverse range of peer-reviewed journal articles, thereby ensuring the reliability and caliber of the obtained literature. The selection of Scopus as the electronic database for this research was made. Data on virtual reality and augmented reality in anatomy education were searched by topic using the search strategy: TS = (("herbal medicine" OR "traditional medicine" OR "herbal therapy" OR "herb therapy" AND "diabetes mellitus" OR dm OR diabetes OR diabetic)).

A total of 8059 documents have been published from 1961 to 2023. The scope of the studies is restricted to the period from 2014 to 2023, including the last 10 years. These papers were collected to investigate the worldwide research patterns in herbal medicine for diabetes mellitus. Following retrieval, only original publications in their final state, published in English journals, were selected for further analysis. There were 3,226 original articles included. Data used in this study were lastly updated on November 2, 2023.

2.2 Data Analysis

In order to gain an understanding of research growth patterns, the most prolific authors, the nation with the most publications, and the most cited journals are extracted from the Scopus database via the analyzed results menu and then downloaded as necessary. Articles were downloaded in CSV format and then processed using Vosviewer 1.6.19 (van Eck and Waltman, 2022) and Bibliometrix (Aria and Cuccurullo, 2017) to visualize and analyze trends in the form of bibliometric maps. Vosviewer and Bibliometrix can make keywords maps based on shared networks.

3 RESULTS

3.1 Research Developments in the Field of Herbal Medicine for Diabetes Mellitus

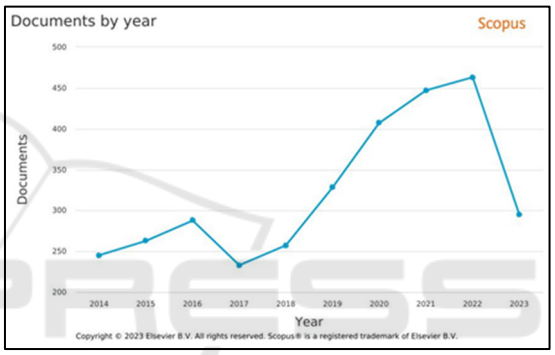

Figure 1: Trend research of herbal medicine for diabetes mellitus in the worldwide for 10 years.

There are 3.226 documents in journal published from 2014-2023 with average annual growt are 2.08 %. The are increasing in scientific publications in the field of herbal medicine for diabetes mellitus demonstrates a worldwide rise in the number of researchers in one decade (2014-2013).The most significant increases happened in 2018-2019, 27.62 percent and 2019-2020, 24.08 percent.

3.2 The Most Profilic Authors in the Publication of Herbal Medicine for Diabetes Mellitus

A total of 13,990 authors were involved in all articles related to herbal medicine for diabetes mellitus. The top ten contributors to publications published in Scopus journals showed in figure 2. Zengin, G. is the most profilic author on the list, having published approximately eighteen works. Thong, X. has authored thirdteen publications, followed by Eddouks, M., Li, P., and Raflean-Kopaeri, M., who have twelve written eight papers.

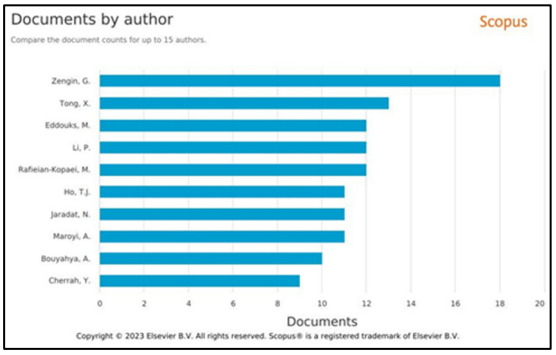

Figure 2: Top Ten Contributing Authors in the area of herbal medicine for diabetes mellitus research worldwide

3.3 Top Ten Countries of Author Based on Publication Number

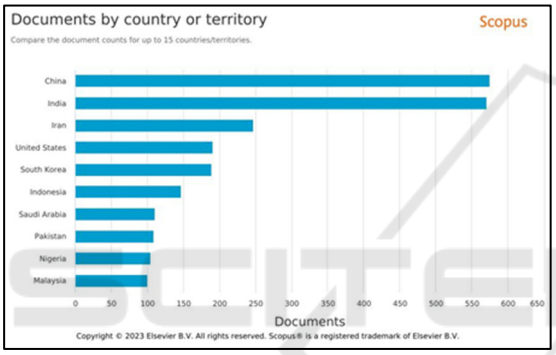

Figure 3: Top Ten Countries in the area of herbal medicine for diabetes mellitus research worldwide

The country with the most publications is China with 574 documents (17.79 percent), second place is India with 570 documents (17.66 percent) and third is Iran with 246 documents (7.62 percent).

3.4 The Core Journal of Herbal Medicine for Diabetes Mellitus

Table 1 lists the top ten peer-reviewed journals that have published the most cited articles in the field of herbal medicine in diabetes mellitus for one decade rs (2014-2023). The journal with the most cited papers is Journal of Ethnopharmacology, which has 241 citations. Then, Evidence Based Complementary and Alternative Medicine contributes to the publication with 88 citations, and Frontiers in Pharmacology with publication of 60 citations, making it a leading scientific publication worldwide.

Table 1: Topten journal by citation in herbal medicine for diabetes mellitus research.

Source Title	Citation
Journal of Ethnopharmacology	241
Evidence Based Complementary and Alternative Medicine	88
Frontiers in Pharmacology	60
Molecules	56
BMC Complementary and Alternative Medicine	53
Biomedicine and Pharmacotherapy	45
Plos One	38
Research Journal of Pharmacy and Technology	38
BMC Complementary Medicine and Therapies	33
Heliyon	28

3.5 Topic Area Visualization Using Vosviewer

In Vosviewer, the default visualization method for keywords related to herbal medicine in diabetes mellitus research themes is to tag and display them as circles. The significance of an item or keyword is directly proportional to its frequency of occurrence, resulting in a larger circle as it appears more frequently. The frequency of repetition impacts the magnitude of the objects. Unsurprisingly, the research issue that received the most attention was diabetes mellitus, as it had the highest frequency of occurrence. Once the color is allocated to the elements, each circle is assigned a distinct color corresponding to its cluster. The result was derived by analyzing the frequency of author keywords in bibliographic data using Vosviewerm (van Eck and Waltman, 2022).

A keyword minimum occurrence number of 10 was defined. Then we got 7555 keywords and merely 150 keywords that satisfied the condition. After analyzing the outcome, we collected 6 groupings as study subjects trends virtual reality in the anatomy education sector denoted by different colors.

The network visualization illustrates six distinct clusters and their interconnections among the identified topic areas. Each cluster comprises multiple keywords that exhibit a strong correlation within the structure of the map. Each cluster has distinct high-frequency instances of terms that indicate the research topic that has been explored in previous research. There are the top three clusters

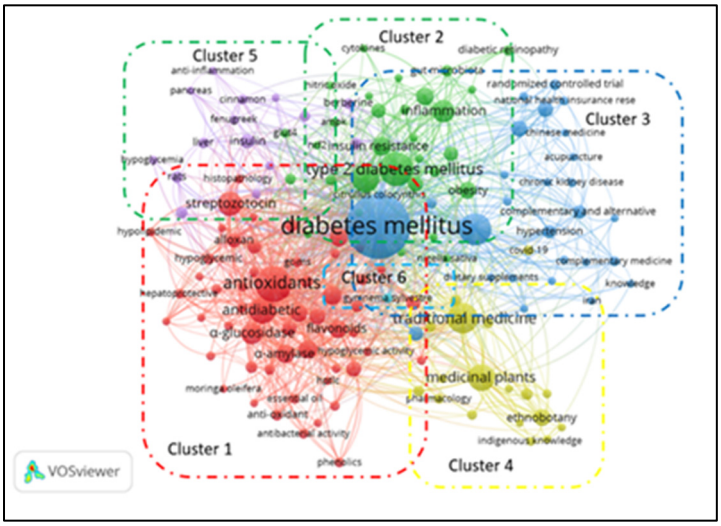

Figure 4: Network Visualization of herbal medicine for diabetes mellitus field publication co-occurrence map using Vosviewer.

with the most frequency of occurrence in the top three keywords. For example, with the most frequent of occurrence the first cluster has the most frequent terms: antioxidant (168), antidiabetic (109), and α-glucosidase (72). The second cluster has oxidative stress (120), type 2 diabetes (103), and inflammation (77) as the most prominent common term. The third cluster includes the most prominent words, such as diabetes mellitus (272), streptozotocin (91), and insulin (34).

3.6 The Most Frequent Keywords of Herbal Medicine in Diabetes Mellitus Publication

Keywords are crucial for conducting research on trends. In addition to serving as a keyword research trend, it also facilitates the discovery of topics relevant to researchers and readers in their respective fields. The meticulous selection of these words will significantly influence the accessibility of searches and the ongoing discourse topics. Each monoword or biword keyword will determine the scope of the literature search and inquiry.

The predominant keywords in the domain of herbal medicine for diabetes mellitus are displayed in Figure 4. Based on the data shown in Figure 5, the phrases that had the highest frequency were diabetes (376 occurrences), diabetes mellitus (273 occurrences), antioxidant (168 occurrences), herbal medicine (161 occurrences), traditional medicine (147 occurrences), oxidative stress (120 occurrences), medicinal plants (116 occurrences), antidiabetic (110 occurrences), type 2 diabetes (103 occurrences), and streptozotocin (91 occurrences). Put simply, the prevailing subjects for publishing in the field of herbal medicine and diabetes mellitus are diabetes mellitus, antioxidants, and herbal medicine.

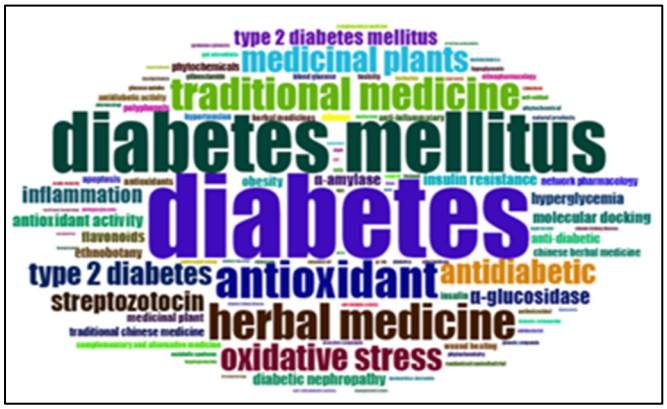

Figure 5: The most used keywords of herbal medicine in diabetes mellitus

3.7 Thematic Map Analysis of Herbal Medicine in Diabetes Mellitus Publication

Furthermore, this discovery can be utilized to formulate a captivating concept that can be published in this domain, specifically pertaining to diabetic mellitus, antioxidant, and herbal medication. The Thematic Map study, depicted in Figure 6, provides evidence to corroborate this finding. The research topic highlighted in the red circle represents a thematic trend that holds potential for future development.

The implementation of the multi-disciplinary theme is a fascinating concept in this subject. Figure 6 illustrates various potential clusters, such as diabetes mellitus, anti-oxidant, inflammation and medicinal herbs. Based on the field or herbal medicine in diabetes mellitus, various subjects related to green, blue, pink, and purple colours are suggested as potential areas for further research.

4 DISCUSSIONS

The management of diabetes mellitus holds significant relevance, with traditional herbal medicine being acknowledged for its potential in addressing this condition. Several scholarly investigations have underscored the efficacy of botanical resources in the therapeutic intervention and control of diabetes (Gaonkar and Hullatti, 2020)(Farzaei *et al.*, 2017).Tran et al. have reported that these particular botanical species possess bioactive constituents that have demonstrated potential efficacy in the management of diabetes(Tran, Bao and Le, 2020). Nevertheless, it is imperative to acknowledge and confront the deceptive endorsement of conventional herbal remedies as a remedy for diabetes within the community (Rutebemberwa *et al.*, 2013). According to (Farzaei *et al.*, 2017), the utilization of complementary and alternative medicine, such as herbal medications, has the potential to be beneficial in the management of diabetes. According to a recent study conducted by (Putrimarlin *et al.*, 2022), it has been observed that plants containing flavonoid components, such as genistein and quercetin, had the ability to enhance insulin production. Consequently, these plants hold potential for utilization in the management and treatment of diabetes. Moreover, the aqueous extract derived from the seeds of *Tamarindus indica* has demonstrated promise in ameliorating hyperglycemia and hyperlipidemia associated with diabetes, as reported by (Maiti, Das and Ghosh, 2005). Herbs have been recognized as a potential adjunct to pharmacological interventions for managing type 2 diabetes mellitus (Proboningsih *et al.*, 2020). However, it is crucial to acknowledge that the efficacy of certain herbs, such as rhubarb, in regulating hyperglycemia can exhibit variability (Shad and Haghighi, 2018). In general, the utilization of traditional medicinal plants shows potential in the treatment of diabetes mellitus. However, additional investigation is required to comprehensively comprehend their underlying mechanisms and enhance their efficacy (Prabhakar and Doble, 2008; Mallick *et al.*, 2007).

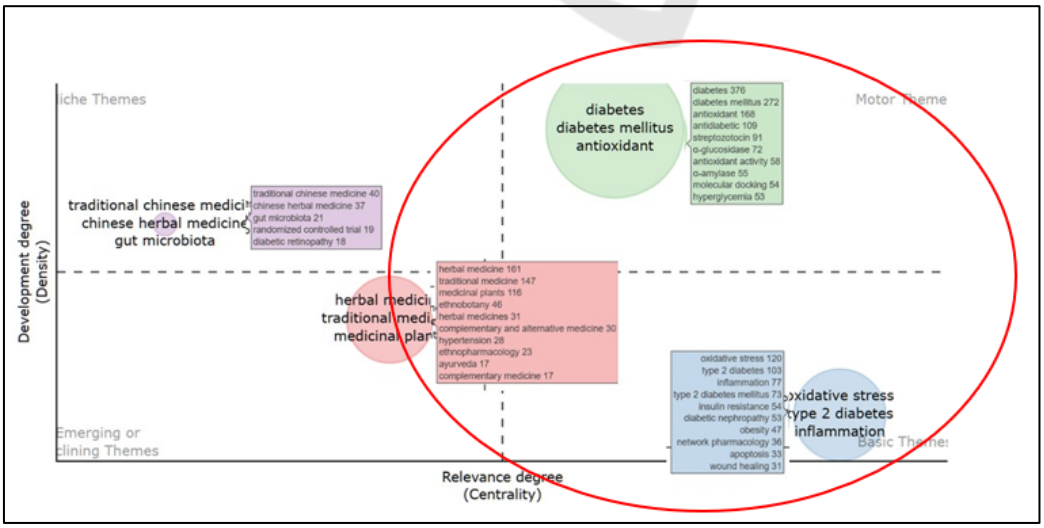

Figure 6: Thematic map analysis of herbal medicine in diabetes mellitus research

5 CONCLUSIONS

Based on data from a decade (2014-2023) we get 3,226 articles, this study suggests that the growth development in herbs for DM with the most significant Scopus index occurred in 2020, which reached 24.08 percent. The Journal of Ethnopharmacology is the most international publications in herbs for DM with 241 documents. The Journal of Ethnopharmacology is also the most influential, with 7,223 citations. China is the country that has the most research papers on herbs for DM (574 documents), while Zengin, G is the most prolific writer (18 documents). Herbs for DM field development map based on co-occurrence is classified into six clusters, and diabetes mellitus, antioxidants, herbal medicine are the most highlighted term throughout the entire network.

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