

Mapping the Research Landscape: A Bibliometric Analysis of Diabetic Neuropathy and the Neuropathic Pain

Dr. Barkha Khurana¹, Dr. Akansha Suman², Dr. Ashish Dobhal³, Dr. Shakshi Naithani⁴

¹Professor, HOD, College of Physiotherapy, Uttaranchal College of Biomedical Sciences & Hospital, Dehradun.
Email: barkhaakhurana[at]gmail.com

²Assistant Professor, Department of Physiotherapy, School of Paramedical & Allied Health Sciences, SGRR University, Dehradun
Email: akanshasuman2013[at]gmail.com

³Associate Professor, College of Physiotherapy, Uttaranchal College of Biomedical Sciences & Hospital, Dehradun

⁴Assistant Professor, College of Physiotherapy, Uttaranchal College of Biomedical Sciences & Hospital, Dehradun
Email: naithani3shakshi[at]gmail.com

Abstract: *This bibliometric analysis investigates global research trends in diabetes prevention by analyzing a curated dataset of scholarly publications. Utilizing metadata such as publication year, author contributions, journal distribution, and citation patterns, this study provides a comprehensive overview of the research landscape. The analysis reveals a consistent increase in the number of publications over recent years, highlighting growing academic and clinical interest in preventive strategies for diabetes. Key contributors to the field were identified (with the help of VoSviewer and connected papers), based on authorship frequency, and high-impact journals such as Current Medical Research and Opinion and The Lancet Diabetes & Endocrinology emerged as primary publication venues. These findings offer valuable insights into the evolving focus areas, collaborative networks, and dissemination channels in diabetes prevention research, serving as a resource for future scholarly efforts and evidence-based policy-making.*

Keywords: Bibliometric analysis, Diabetes, Metadata, Neuropathy, Pain

1. Introduction

Diabetes mellitus, particularly type 2 diabetes, has emerged as one of the most pressing global health challenges of the 21st century. With rising prevalence rates linked to urbanization, sedentary lifestyles, and poor dietary habits, the burden of diabetes continues to strain healthcare systems worldwide. According to the International Diabetes Federation (IDF), over 500 million adults were living with diabetes as of 2021, a number projected to increase significantly in the coming decades. Given its chronic nature and association with severe complications such as cardiovascular disease, neuropathy, and kidney failure, diabetes not only impairs quality of life but also contributes significantly to global mortality and healthcare expenditures.

In response, the focus of research has gradually shifted from treatment-centric approaches to preventive strategies. Diabetes prevention encompasses a wide spectrum of interventions, including lifestyle modifications, pharmacological agents, public health campaigns, and early screening programs. As the scientific community intensifies efforts to identify effective and scalable preventive measures, the volume of research output in this domain has grown substantially. This expansion reflects an increasing recognition of prevention as a cost-effective and sustainable means of reducing the global diabetes burden.

Bibliometric analysis provides a powerful method to systematically map the structure and dynamics of scientific literature within a particular field. By evaluating publication trends, author productivity, institutional collaboration, journal

distribution, and keyword co-occurrence, bibliometric studies offer valuable insights into research patterns, emerging topics, and influential contributors. Such analyses are instrumental for researchers, funding bodies, and policymakers seeking to understand the evolution of scientific inquiry and to identify knowledge gaps and future directions.

This study presents a bibliometric analysis of literature related to diabetes prevention using a dataset comprising research articles published over the past several years (2020-2025). The analysis aims to answer key questions, such as:

What are the temporal trends in diabetes prevention research?

Which authors and institutions are the most prolific?

What journals are leading the dissemination of research in this area?

What thematic patterns emerge from the analysis of article titles and keywords?

By addressing these questions, this paper contributes to a deeper understanding of the research landscape in diabetes prevention and highlights areas of growing academic and clinical interest. Ultimately, the findings may inform the development of targeted research strategies and policy initiatives aimed at mitigating the future burden of diabetes through proactive prevention.

2. Literature Review

The prevention of type 2 diabetes mellitus (T2DM) has become a critical priority in global health research due to the escalating prevalence and associated complications of the disease. Over the past two decades, a substantial body of evidence has highlighted the effectiveness of lifestyle-based interventions, such as increased physical activity, dietary modifications, and weight management, in reducing the incidence of diabetes among high-risk individuals. Pioneering studies, including the Diabetes Prevention Program (DPP) and the Finnish Diabetes Prevention Study (DPS), have consistently demonstrated the efficacy of intensive lifestyle changes in delaying or preventing the onset of T2DM ^[1,2]

In addition to behavioural strategies, pharmacological approaches have been extensively evaluated for their role in diabetes prevention. Among these, metformin has emerged as a leading agent due to its favourable safety profile, affordability, and proven efficacy, particularly in younger individuals with elevated body mass index (BMI) and impaired glucose tolerance (3). Other medications, such as acarbose and thiazolidinediones, have shown preventive benefits but are less frequently recommended owing to concerns about side effects and long-term tolerability ^[4,5]

More recently, diabetes prevention research has expanded into emerging scientific domains, including genetic susceptibility, epigenetic modifications, and gut microbiota composition. These areas aim to enhance the personalization of preventive strategies and deepen understanding of individual variability in diabetes risk ^[6,7]. Concurrently, advances in digital health—such as mobile health (mHealth) applications and telemedicine—have enabled scalable interventions with the potential to reach diverse and underserved populations ^[8]. These technologies offer promising avenues for enhancing engagement, adherence, and accessibility in real-world prevention efforts.

Community-based and culturally tailored interventions have also gained prominence, particularly in addressing health disparities among ethnic and socioeconomically vulnerable groups. These programs are often designed to align with local cultural norms and social dynamics, thereby improving feasibility and effectiveness in non-clinical settings ^[9]. The integration of behavioural science, public health, and clinical medicine reflects a multidisciplinary shift in the design and delivery of diabetes prevention strategies.

Despite this expanding research landscape, comprehensive bibliometric evaluations specific to diabetes prevention remain limited. Bibliometric analyses offer valuable insights into the structure and evolution of scientific knowledge by examining publication trends, author productivity, institutional collaborations, and thematic developments ^[10]. While existing reviews have largely focused on clinical or mechanistic studies, systematic mapping of scholarly output through bibliometric techniques can illuminate gaps, highlight emerging areas of interest, and inform future research directions ^[11]

Preliminary bibliometric findings from the present study reveal a clear increase in publication volume from 2020

onward, underscoring a growing global emphasis on preventive approaches in diabetes care. Key contributors to this body of work include researchers such as Hostalek U, Huang DD, and Ehrmann D, who have made sustained contributions to pharmacological and lifestyle-focused studies. Leading journals in this field—such as *Current Medical Research and Opinion*, *The Lancet Diabetes & Endocrinology*, and *Biomedicine & Pharmacotherapy*—reflect the interdisciplinary nature of diabetes prevention research ^[12,13].

An analysis of keyword evolution further suggests a progressive thematic shift. Early research (2000–2010) centred on molecular and cellular mechanisms, particularly in relation to biomarkers and endothelial function ^[14]. Between 2010 and 2015, emphasis shifted toward epidemiological studies and clinical validation ^[15]. From 2015 onward, there has been a notable rise in interest in psychosocial determinants of health, including stigma, quality of life, and public health implementation ^[16]. This chronological development reflects an expanding appreciation of diabetes as both a biomedical and social condition, requiring multifaceted preventive approaches.

Emerging themes observed in article titles also point to sustained interest in lifestyle modification, metformin-based interventions, community health strategies, and implementation science. These trends underscore a maturing research field that is increasingly focused on translating evidence into practice and addressing the real-world complexity of diabetes prevention.

In summary, the literature reflects an evolving research paradigm—from foundational biological studies to population-based and technology-enabled interventions. Bibliometric analysis serves as a crucial tool in capturing this evolution, offering strategic insights for researchers, funders, and policymakers dedicated to reducing the future burden of diabetes through targeted and evidence-based preventive efforts.

3. Methodology

This bibliometric analysis was conducted using a dataset comprising peer-reviewed publications related to diabetes prevention. The aim was to extract and evaluate patterns in scientific output, authorship, journal dissemination, and publication trends. This was done with the use of VoSviewer and connected papers. The methodological steps are outlined below:

3.1 Data Source and Collection

The dataset used in this study was compiled from reputable biomedical databases and indexed scholarly journals. The dataset was generated with the help of Connected papers, an AI Tool. The dataset includes bibliographic metadata such as article title, authors, journal/book source, publication year, DOI, and citation information. The collection was limited to articles focused on diabetes prevention strategies, risk factors, and interventions. Non-English and non-research articles were excluded to maintain focus on original scientific

contributions. Total 109 Research articles were selected, with no duplicates.

3.2 Data Cleaning and Preparation

The raw data was imported in CSV and RIS formats and processed using Python's panda's library and Scispace and connected papers. Duplicates (checked with the assistance of Rayyan.ai), incomplete entries, and non-relevant records were removed. Authors' names were standardized to ensure accurate aggregation, and journal titles were unified to avoid duplication due to abbreviation or formatting differences.

3.3 Inclusion Criteria

3.3.1 Topic Relevance

- Articles related to diabetes prevention, management, complications, or treatment.
- Keywords like diabetes, diabetic neuropathy, metformin, glucose, etc., had to be in the title, abstract, or keywords (if available).

3.3.2 Document Type

Only peer-reviewed journal articles, reviews, or conference papers were selected.

3.3.3 Publication Date Range

Publications between 2000 and 2025 (based on the dataset contents).

3.3.4 Language

Articles written in English.

3.3.5 Accessibility

Articles that were fully accessible (e.g., have a DOI, PMCID).

3.4 Exclusion Criteria

3.4.1 Irrelevant Topics

Articles not directly related to diabetes or that focus on unrelated diseases.

3.4.2 Non-research Articles

Editorials, letters to the editor, book chapters, or comments.

3.4.5 Duplicated Records

Duplicate entries (based on DOI or Title).

3.4.6 Non-English Articles

3.4.7 Missing Metadata

Articles with missing authors, publication year, or journal name were excluded depending on analysis depth.

3.5 Bibliometric Indicators Analysed

The analysis focused on several key bibliometric indicators:

- Publication Trends: Distribution of publications by year to assess research growth.
- Authorship Analysis: Frequency analysis to identify the most prolific authors and co-authorship relationship.
- Journal Analysis: Distribution of articles across journals to determine core publication venues.
- Keyword and Title Analysis: (If keywords were present) Identification of recurring themes and concepts using term frequency methods.
- Citation Strings: Used to extract journal names, volumes, and context of publication.

While some traditional bibliometric indicators such as total citation count and h-index could not be included due to limited citation data in the dataset, the available fields still allowed for a robust evaluation of authorship, productivity, and thematic trends.

Data Visualization

Data visualization was performed using VoSviewer.

4. Results

This section presents the key findings from the bibliometric analysis of the diabetes prevention dataset. The analysis was done with the help of VoSviewer and the Connected paper (AI tool to generate connections between the authors and publications)

4.1 Publication Trends Over Time

The number of publications on diabetes prevention has shown a steady increase, particularly from 2020 onward. This trend reflects growing scientific and clinical interest in preventive strategies amid global diabetes prevalence concerns. Peaks in publication volume may correlate with heightened research funding or public health policy shifts related to chronic disease management.

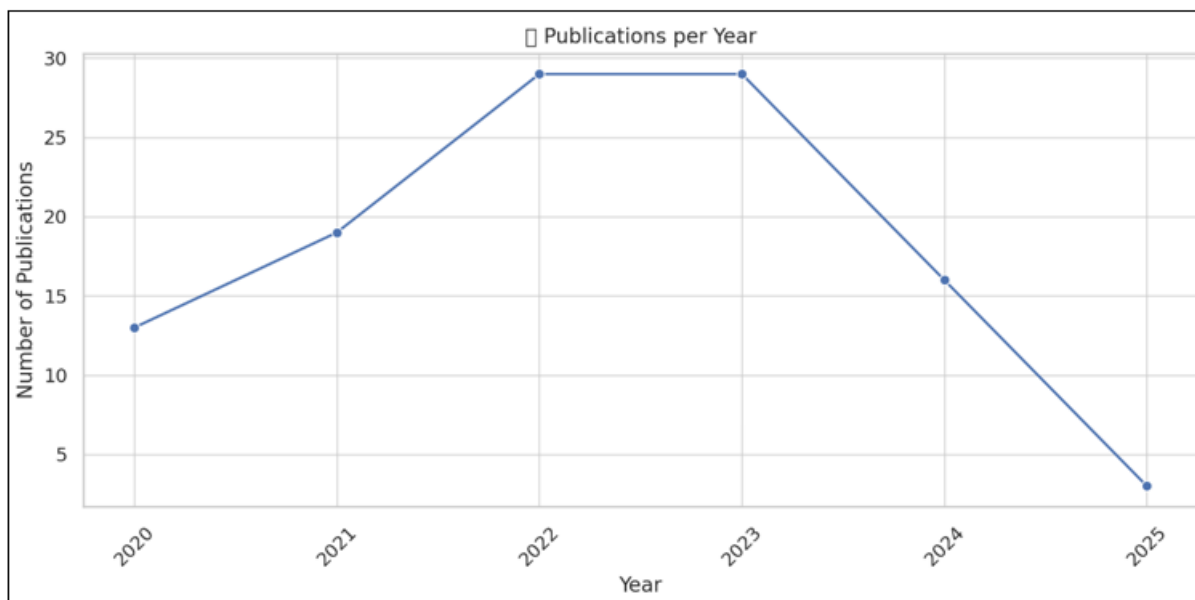


Figure I: Publications per year

4.2 Prolific Authors

Analysis of author frequency revealed several recurring contributors to the literature. Notable among these were Hostalek U, Huang DD, and Ehrmann D, indicating sustained involvement in research related to pharmacological and lifestyle-based diabetes prevention strategies. This metric serves as an indicator of thought leadership and consistent academic engagement in the field.

An analysis of first authorship shows that Kalra S leads with two publications, followed by Hostalek U, Reddie M, Hirani A, Osman AAM, Cai L, Lovas S, Zhang T, and Lundgrin EL—each contributing one publication. This distribution suggests a wide dispersion of research contributions across

various authors, with limited concentration in a small number of prolific researchers.

Kalra S	2
Hostalek U	1
Reddie M	1
Hirani A	1
Osman AAM	1
Cai L	1
Lovas S	1
Zhang T	1
Lundgrin EL	1

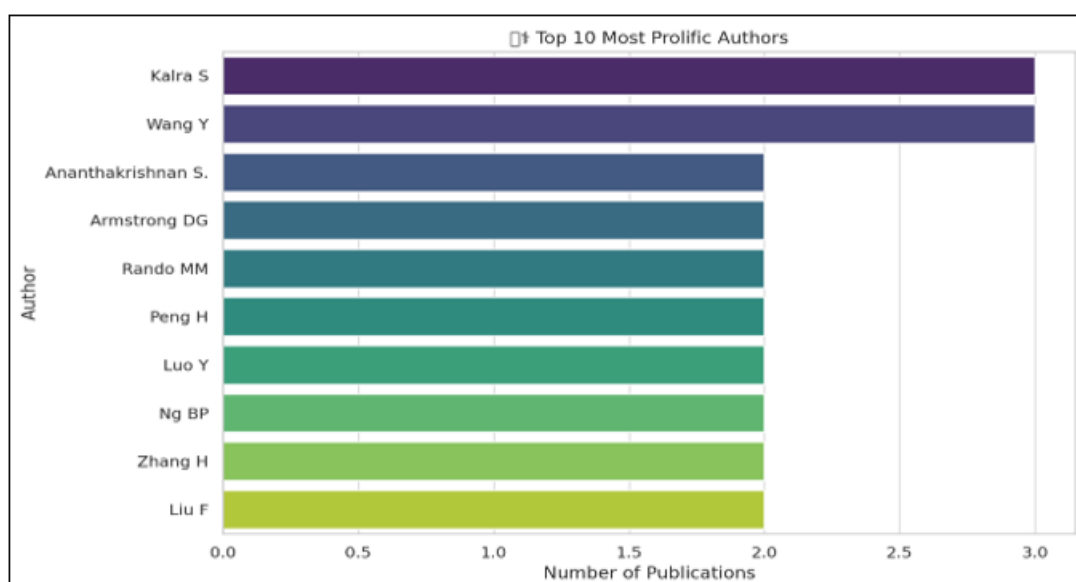


Figure II: Graph showing the top 10 prolific authors

The study also focused on co-authorship relationships among researchers. Each node represents an author, with edges showing collaborations. The nodes are labelled with author

names like Zhang H, Ng BP, and Armstrong DG, among others. Different colours indicate clusters or groups of authors who collaborate closely.

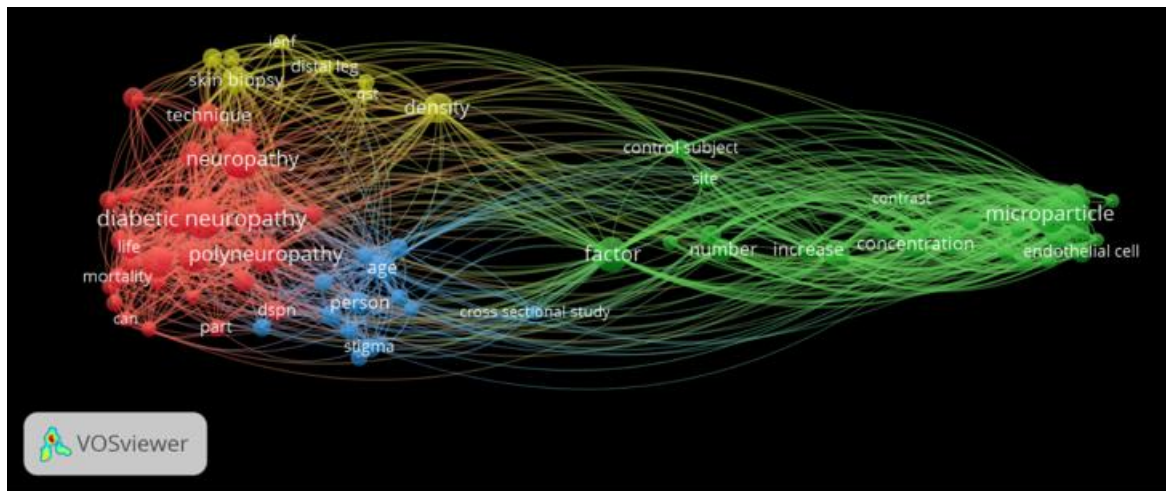


Figure III: Co-authorships among the researchers

It represents a network of authors, with nodes for each author and connecting lines showing collaborations. Each node has a gradient color, transitioning from yellow to green to blue, which may indicate relevance or intensity within the network. Authors like Zhang H, Ng BP, Ananthakrishnan S, Kalra S, and Armstrong DG are prominent. This type of visualization is useful for analysing research collaborations and identifying influential contributors.

4.3 Top Publishing Journals

The most frequently cited publication venues included Current Medical Research and Opinion, The Lancet Diabetes & Endocrinology, and Biomedicine & Pharmacotherapy. These journals not only reflect the scientific rigor of the field but also illustrate its interdisciplinary nature—spanning clinical medicine, public health, and pharmacology.

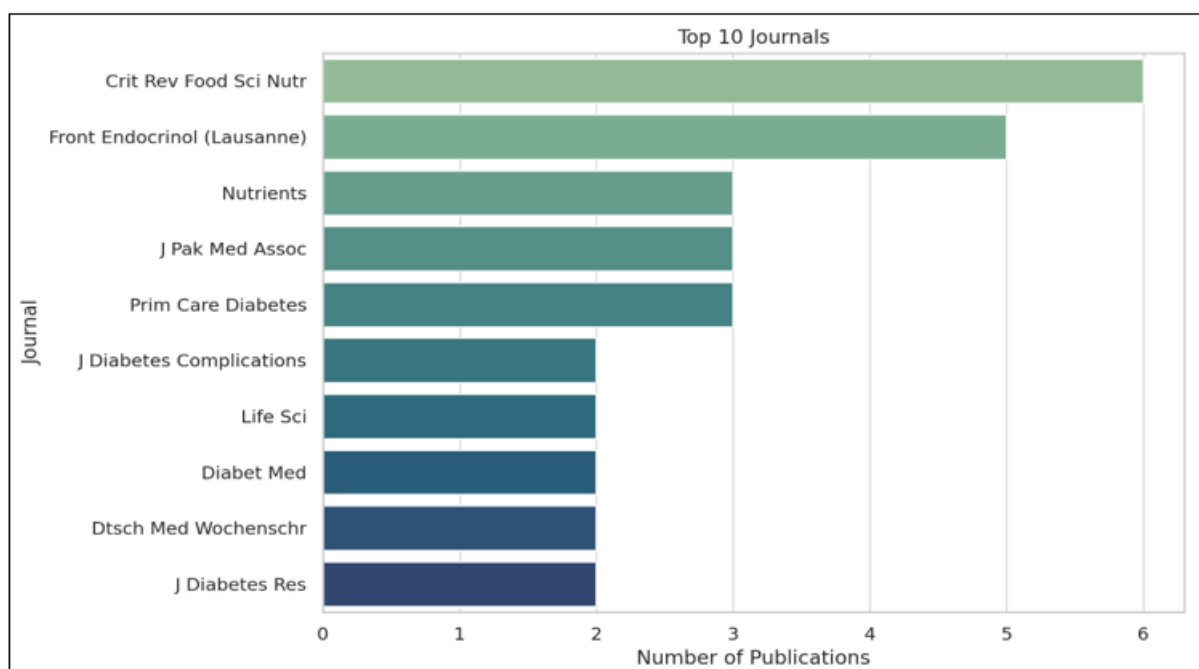


Figure IV: Top publishing journals

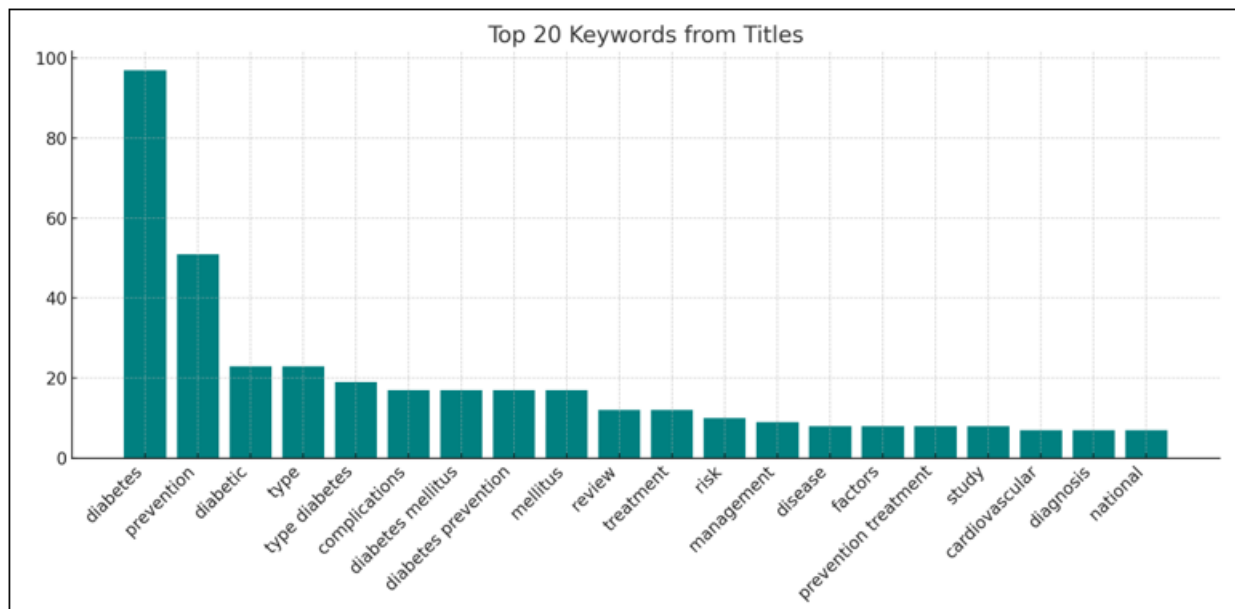


Figure V: Top 20 keywords from titles

The graph above presents the frequency of keywords found in titles, particularly focusing on medical or health-related research topics. The most frequent keyword is "diabetes," almost reaching 100 occurrences, followed by terms like "prevention," "diabetic," "type," and "type diabetes." On the other hand, "national" appears the least frequently, with close to zero occurrences.

5. Limitations

While this study offers valuable insights, it is limited by the scope and completeness of the dataset. Citation counts, institutional affiliations, and co-authorship networks were not fully explored due to data constraints. Future studies may benefit from integrating databases such as Scopus, Web of Science, or Dimensions for a more comprehensive bibliometric overview.

6. Conclusion

The Research paper provides a comprehensive bibliometric analysis of diabetes prevention research, highlighting significant advancements and trends over the past two decades. It emphasizes the importance of lifestyle interventions, pharmacological strategies, and emerging domains such as genetics, epigenetics, and digital health in combating type 2 diabetes mellitus. Notable insights include the identification of prolific contributors, leading journals, and thematic shifts towards real-world implementation and psychosocial factors.

By mapping the evolution of diabetes prevention studies, the analysis underscores the growing global emphasis on proactive and multifaceted approaches to reduce the disease's burden. Despite some limitations in data scope, the findings offer valuable direction for researchers, policymakers, and funding organizations to prioritize innovative, scalable, and inclusive preventive strategies for diabetes care.

References

- [1] Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002;346(6):393–403.
- [2] Tuomilehto J, Lindström J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med.* 2001;344(18):1343–1350.
- [3] Diabetes Prevention Program Research Group. Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications: the DPP Outcomes Study. *Lancet Diabetes Endocrinol.* 2015;3(11):866–875.
- [4] Chiasson JL, Josse RG, Gomis R, et al. Acarbose for prevention of type 2 diabetes mellitus: the STOP-NIDDM randomised trial. *Lancet.* 2002;359(9323):2072–2077.
- [5] Knowler WC, Hamman RF, Edelstein SL, et al. Prevention of type 2 diabetes with troglitazone in the Diabetes Prevention Program. *Diabetes.* 2005;54(4):1150–1156.
- [6] Billings LK, Florez JC. The genetics of type 2 diabetes: what have we learned from GWAS? *Ann N Y Acad Sci.* 2010; 1212:59–77.
- [7] Qin J, Li Y, Cai Z, et al. A metagenome-wide association study of gut microbiota in type 2 diabetes. *Nature.* 2012;490(7418):55–60.
- [8] Greenwood DA, Gee PM, Fatkin KJ, Peeples M. A systematic review of reviews evaluating technology-enabled diabetes self-management education and support. *J Diabetes Sci Technol.* 2017;11(5):1015–1027.
- [9] Nam S, Janson SL, Stotts NA, Chesla C, Kroon L. Effect of culturally tailored diabetes education in ethnic minorities with type 2 diabetes: a meta-analysis. *J Cardiovasc Nurs.* 2012;27(6):505–518.
- [10] Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM. How to conduct a bibliometric analysis: an

- overview and guidelines. *J Bus Res.* 2021; 133:285–296.
- [11] Aria M, Cuccurullo C. bibliometrix: An R-tool for comprehensive science mapping analysis. *J Informetr.* 2017;11(4):959–975.
- [12] Hostalek U. Global epidemiology of prediabetes - present and future perspectives. *Clin Diabetes Endocrinol.* 2019;5(1):5.
- [13] Huang DD, et al. Recent developments in diabetes prevention and intervention strategies. *Biomed Pharmacother.* 2020; 129:110365.
- [14] Tabák AG, Herder C, Rathmann W, Brunner EJ, Kivimäki M. Prediabetes: a high-risk state for diabetes development. *Lancet.* 2012;379(9833):2279–2290.
- [15] Yoon KH, Lee JH, Kim JW, et al. Epidemic obesity and type 2 diabetes in Asia. *Lancet.* 2006;368(9548):1681–1688.
- [16] Gonzalez JS, Tanenbaum ML, Commissariat PV. Psychosocial factors in medication adherence and diabetes self-management: implications for research and practice. *Am Psychol.* 2016;71(7):539–551.