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REVIEW ARTICLE

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Artificial Intelligence in Nutritional Sciences: A Bibliometric Analysis of Global Research Trends and Thematic Evolutions

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ABSTRACT

Background: The integration of Artificial Intelligence (AI) into the field of nutritional sciences has gained considerable momentum in recent years, offering promising opportunities for personalized dietary assessment, nutritional epidemiology, food safety, and public health surveillance, However, despite the escalating volume of literature, a comprehensive understanding of global publication trends, collaborative networks, prominent contributors, and evolving thematic landscapes within this interdisciplinary domain remains limited.

Aims: This study aimed to systematically evaluated the research landscape at the intersection of AI and nutrition utilizing bibliometric techniques to identify publication trends, prolific authors, influential source journals, leading geopolitical contributors and institutions, and emerging research themes.

Methods: A bibliometric evaluation was executed utilizing metadata retrieved from the Scopus database. The search matrix targeted literature published between 2013 and 2023. From an initial pool of 1,167 documents, 350 peer-reviewed publications were retained following the application of strict, predefined inclusion and exclusion criteria based on subject area, language, document type, and thematic relevance. Analytical and visualization protocols—encompassing publication trajectories, citation impacts, international collaboration networks, and keyword co-occurrence maps—were executed using VOSviewer and Microsoft Excel.

Results: The analysis revealed a substantial acceleration in scientific output during the final five years of the study period (2019-2023), highlighting intensified scholarly interest in AI-driven nutritional applications. The United States, China, and India emerged as the primary global contributors. Prominent dissemination outlets included *Nutrients*, the *Journal of Nutrition*, and the *EFSA Journal*. Network clustering identified five primary research fronts: AI-based dietary assessment, public health nutrition, machine learning applications for chronic disease prediction, food safety, and the ethical governance of digital nutritional data. The most robust keyword co-occurrence nodes included "Nutrition," "Artificial Intelligence," "Dietary Intake," and "Machine Learning."

Conclusions: This bibliometric analysis underscores the rapid evolutionary trajectory and highly multidisciplinary nature of the AI-nutrition interface. The domain is characterized by expanding international collaboration, diversified thematic developments, and a profound integration of AI technologies into foundational nutritional science. These insights elucidate the intellectual architecture of the field, serving as a strategic framework to guide future empirical research, policy formulations, and technological innovation in AI-driven nutrition.

Keywords: Artificial Intelligence; Nutritional Sciences; Bibliometric Analysis; VOSviewer; Research Trends; Public Health Nutrition.

Article Information

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1 INTRODUCTION

Artificial intelligence (AI) has emerged as one of the most transformative technologies in contemporary healthcare and life sciences, enabling advanced data processing, predictive analytics, and data-driven decision-making across diverse scientific domains. Recent developments in machine learning, deep learning, natural language processing, and computer vision have significantly expanded the capacity of researchers and healthcare professionals to analyze large and complex datasets, generating new opportunities for disease prevention, personalized interventions, and health promotion (Kirk *et al.*, 2021; Sak & Suchodolska, 2021; Sosa-Holwerda *et al.*, 2024). Within the field of nutrition, AI has gained increasing attention as a promising tool for improving dietary assessment, supporting precision nutrition strategies, enhancing food safety systems, and facilitating personalized dietary recommendations (Agrawal *et al.*, 2025; Kassem *et al.*, 2025; Panayotova, 2025).

The rapid growth of digital health technologies, wearable sensors, mobile applications, and nutritional databases has accelerated the integration of AI into nutrition research and practice. Machine learning algorithms are increasingly utilized to identify dietary patterns, predict nutrition-related health risks, and optimize individualized dietary interventions based on behavioral, clinical, and biological data (Ferreira *et al.*, 2025; Quan *et al.*, 2025; Wu *et al.*, 2025). In particular, the emergence of precision nutrition has highlighted the

potential of AI to combine dietary data with genetic, metabolic, environmental, and lifestyle factors, thereby enabling more tailored nutritional recommendations and improved health outcomes (Ferreira *et al.*, 2025; Kirk *et al.*, 2021; Mundt *et al.*, 2025).

Recent studies have demonstrated the value of AI-driven approaches in addressing major public health challenges associated with obesity, type 2 diabetes, cardiovascular diseases, and malnutrition. Predictive models based on machine learning have demonstrated considerable potential for identifying individuals at risk of obesity and supporting preventive interventions (Kalhori *et al.*, 2025; Safaei *et al.*, 2021). Correspondingly, AI-enabled digital health solutions have been developed to support personalized nutritional management of chronic diseases through continuous monitoring and adaptive dietary recommendations (Gavai & Van Hillegersberg, 2025; Navratilova *et al.*, 2025). These advances illustrate the escalating role of AI in transforming nutrition from a population-based discipline toward a more individualized and data-driven approach.

Another rapidly expanding area involves the utilization of AI for dietary assessment and nutritional monitoring. Traditional dietary assessment methods are frequently limited by recall bias, reporting errors, and administrative challenges. To overcome these limitations, researchers have developed AI-assisted systems capable of automatically recognizing foods, estimating portion sizes, and quantifying nutrient intake employing image analysis, mobile applications, and intelligent data-processing techniques (Phalle & Gokhale, 2025; Zheng *et al.*, 2023). Such innovations present the potential to improve the accuracy, efficiency, and scalability of nutritional assessment in both clinical and public health settings.

Beyond its contribution to the advancement of personalized nutrition, artificial intelligence has emerged as an essential instrument for enhancing food safety and optimizing the management of contemporary food systems. AI-driven technologies are being increasingly deployed across the food supply chain to detect potential contamination, monitor food quality, reinforce product traceability, and support evidence-based decision-making aimed at safeguarding consumer health (Liu *et al.*, 2023; Yin *et al.*, 2025). Collectively, these advancements reflect the broad, interdisciplinary role of AI within the fields of nutrition and food sciences, while further illustrating the sustained expansion of research and innovation characterizing this rapidly evolving domain.

As a result of these scientific and technological advances, the number of publications investigating the intersection of AI and nutrition has increased substantially over the past decade. The field has evolved into a multidisciplinary research domain that integrates nutrition science, computer science, data analytics, public health, food technology, and digital medicine. Consequently, elucidating the intellectual structure, research dynamics, and thematic evolution of this rapidly growing body of literature has become increasingly crucial for researchers, practitioners, and policymakers.

Bibliometric analysis provides a robust methodological framework for quantitatively evaluating scientific production and mapping the development of research fields. Through the analysis of publication trends, citation patterns, collaboration networks, and thematic structures, bibliometric techniques facilitate the identification of influential contributors, emerging topics, and knowledge gaps within a discipline (Cobo *et al.*, 2011; Van Eck & Waltman, 2010; Zupic & Čater, 2015). In recent years, bibliometric methods have become widely adopted for assessing rapidly evolving interdisciplinary research areas and informing future research agendas (Aria & Cuccurullo, 2017; Donthu *et al.*, 2021).

Despite the growing body of literature on AI applications in nutrition, a comprehensive understanding of the global research landscape remains limited. Existing reviews have primarily focused on specific applications, such as precision nutrition, dietary assessment, obesity prediction, or food safety, whereas less attention has been dedicated to examining the overall scientific evolution of the field, including publication growth, international collaboration patterns, influential authors and institutions, and emerging thematic trends. Addressing this gap is critical for understanding the current state of knowledge and identifying future directions for research and innovation.

Therefore, the present study aimed to conduct a comprehensive bibliometric analysis of research on artificial intelligence (AI) and nutritional science employing prestigious databases such as Scopus. Specifically, this study seeks to address the following research questions:

a. How has scientific output at the intersection of artificial intelligence and nutrition science evolved over time?

b. Which journals, authors, institutions, and countries represent the primary contributors to this domain?

c. What global collaboration networks and patterns characterize research on AI and nutrition?

d. What are the prevailing research themes, intellectual clusters, and emerging topics within this literature?

e. What strategic directions for future research emerge from the intellectual and conceptual architecture?

By providing a systematic overview of publication trends, collaboration networks, influential contributors, and

thematic developments, this study contributes to a profounder understanding of the evolving role of artificial.

2 Material and Methods

2.1 Search Strategy and Data Retrieval

This study employed bibliometric and visualization techniques to systematically analyze the global research landscape surrounding artificial intelligence (AI) applications in nutrition science over the past decade. Bibliometric analysis enables the quantitative evaluation of scientific literature to map publication trends, identify influential contributors, map international collaboration networks, and unveil emerging thematic domains.

Data were retrieved from the Scopus database, recognized for its extensive coverage of peer-reviewed multidisciplinary literature. The literature search was conducted on July 19, 2024, utilizing the following query:

TITLE-ABS-KEY ("AI" AND "nutrition")

2.2 Inclusion and Exclusion Criteria

The search was limited to publications published between 2013 and 2023 to capture the ten-year evolution of the field. To ensure topical alignment and scientific rigor, explicit eligibility criteria were applied (Table 1):

- **Subject Areas:** restricted to the *Medicine*, *Agricultural and Biological Sciences, Computer Science, Biochemistry, Genetics and Molecular Biology, Chemistry, Health Professions, and Chemical Engineering*.
- **Document Types**: Limited to original research articles and review papers. Conference papers, editorials, letters, and book chapters were excluded.
- **Language**: Restricted to English-language publications.

The initial automated query yielded 1,167 documents. The retrieved records were subsequently filtered according to predefined inclusion criteria, including publication years (2013 – 2023), subject area classifications, language (English), and document type (articles and review papers). The resulting records were then screened for topical relevance to artificial intelligence and nutrition, and non-related publications were excluded. This process resulted in a final dataset of 350 publications for bibliometric analysis. For data processing and analysis, VOSviewer and Microsoft Excel were employed to visualize research trends, collaboration networks, and keyword co-occurrence patterns.

Figure 1 illustrates the analytical framework adopted in this study. The framework summarizes the principal stages of data collection and filtering, including the Scopus search query, publication year restrictions, subject area selection, language filtering, and the final inclusion of 350 publications for bibliometric analysis.

Table 1. The Inclusion and Exclusion Criteria for Data Screening

Inclusion Criteria
▪ Studies related to AI applications in nutrition
▪ Research articles published in English
▪ Bibliometric studies focusing on AI and dietary analysis
▪ Studies on AI-driven dietary assessment and public health
Exclusion Criteria
▪ Studies unrelated to AI and nutrition
▪ Articles in languages other than English
▪ Conference papers, proceedings, non-indexed publications
▪ AI applications in unrelated fields (e.g., engineering, finance)

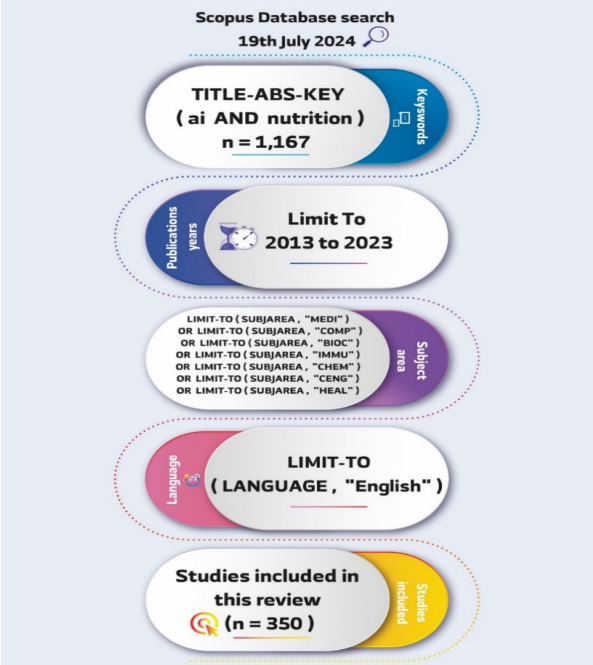

Figure 1. Analytic Framework of the Study

2.3 Bibliometric Analysis

The bibliometric analysis method was employed in this study to examine research trends in AI and nutrition. This approach allowed for the identification of the most frequently used keywords, the most cited and productive journals, the leading countries in AI and nutrition research, and international collaboration networks. Additionally, the study analyzed keyword co-occurrence patterns, the most cited authors, author collaboration networks, and co-citation relationships among journals. To achieve these objectives, VOSviewer was utilized to visualize bibliometric networks and research trends effectively. Given the increasing number of studies in this field, it is essential to investigate the thematic structure of AI applications in nutrition through systematic bibliometric techniques. This analysis aims to provide insights into the key research areas, emerging trends,

and the overall scientific landscape shaping the intersection of AI and nutrition.

Source and Author Metric Definitions

To evaluate publication venues, journal-level indicators—including Total Publications (TP), Total Citations (TC), Cite-Score, and Most Cited Article—were retrieved directly from Scopus journal metrics to provide contextual information regarding the visibility and scientific influence of the publication venues represented within the dataset. These indicators served as indicators to characterize the journals represented in the dataset and should not be interpreted as publication counts derived exclusively from the final corpus of analyzed articles.

Author-level impact was contextualized utilizing Total Publications (TP), h-index, Total Citations (TC), current institutional affiliation, and country profiles extracted from individual Scopus profiles. Source and author profile metrics reflect overall scientific productivity and cumulative impact across Scopus profiles rather than metrics restricted exclusively to the 350 publications constituting the core study corpus.

3 Results

The present study aims to reveal the research profile on AI applications in nutrition science over the past decade. The findings of this review were analyzed and discussed based on the research objectives.

Research Question 1 (RQ1)

What is the distribution of AI and nutrition publications by years for the last decade?

To address the first finding, an analysis was conducted of the publication year of the articles through the previous decade. It was noticed that the publications were primarily published in the last couple of years; in year 2023, a total number of 70 publications were published concerning AI and nutrition science; in year 2022, a total number of 62 publications were published regarding AI and nutrition science, followed by a total number of 44 publications in year 2021. The other publications were distributed for the rest of the years, as displayed in Figure 2. For instance, in 2020, a total of 29 publications were recorded, while in 2019, the number was 19. The publication count remained relatively reduced in earlier years, with 18 publications in 2018, 16 in 2017, 20 in 2016, 26 in 2015, 16 in 2014, and 30 in 2013. These findings indicate a growing research interest in AI applications in nutrition science field, particularly in the last five years.

Research Question 2 (RQ2)

What are the most relevant journals and authors in AI and nutrition research?

To evaluate the academic venues disseminating AI-nutrition research, journal-level indicators—including Total Publications (TP), Total Citations (TC), CiteScore, and top-cited articles—were compiled from Scopus profiles (Table 2).

Among the key publication venues represented in the core dataset, *Nutrients* demonstrated the highest publication volume and overall citation activity, reflecting its central role as a open-access platform for multidisciplinary nutrition studies. Other high-impact journals frequently publishing in this domain include the *Journal of Animal Science* and the *EFSA Journal* (European Food Safety Authority). These venues bridge the gap between computational approaches, clinical nutrition, animal science, and dietary safety assessment.

The journal-level bibliometric profiles are presented in Table 2. On the other hand, RQ2 also investigated the most prolific authors represented within the AI and Nutrition research landscape. Author-level impact was contextualized using cumulative Scopus profile indicators, including Total Publications (TP), *h*-index, Total Citations (TC), current affiliation, and country as summarized in Table 3.

The analysis identified several highly influential researchers whose work intersects with AI applications in nutrition, lifestyle, and clinical health:

- **L.A. Moreno** (University of Zaragoza, Spain): Exhibited an extensive publication profile (1,140 total documents, 63,248 citations, *h*-index = 100).
- **K.I. Hirsch-Ernst** (McMaster University Medical Centre, Hamilton): Profiled with the highest scholarly impact index among the leading authors (*h*-index = 144).
- **J. Salas-Salvadó** (Universitat Rovira i Virgili, Spain): Demonstrated substantial scholarly influence with over 50,000 citations and an *h*-index of 111.

These indicators highlight that leading contributors to AI-nutrition research are predominantly established investigators in public health, clinical nutrition, and nutritional epidemiology who actively integrate digital and computational tools into large-scale cohort studies. Furthermore, the indicators provide contextual information regarding the scientific visibility and academic influence of researchers represented in the dataset and should not be interpreted as publication counts derived exclusively from the final corpus of analyzed articles. Additional author-level bibliometric profiles are presented in Table 3.

Table 2. Journal-Level Bibliometric Indicators of Leading Publication Venues Represented in the Dataset and Nutrition Research in

Journal	TP	TC	Cite score	The most Cited Article	Times Cited	Publisher
Nutrients	18477	170794	9.2	Short-Chain Fatty-Acid-Producing Bacteria: Key Components of the Human Gut Microbiota	94	MDPI
Journal of Animal Science	1616	7746	4.8	Glycine Regulates Lipid Peroxidation Promoting Porcine Oocyte Maturation and Early Embryonic Development	15	Oxford University Press
EFSA Journal	1795	9314	5.2	Re-evaluation of the Risks to Public Health Related to the Presence of Bisphenol A (BPA) in Foodstuffs	98	John Wiley & Sons
Journal of Nutrition	1398	190578	7.6	Friend or Foe? The Role of Animal-Source Foods in Healthy and Environmentally Sustainable Diets	41	Elsevier
Journal of the American College of Nutrition	240	1975	8.2	Does Serum Vitamin D Level Affect COVID-19 Infection and Its Severity? - A Case-Control Study	69	Taylor & Francis
Theriogenology	1660	9185	5.5	*In vitro* Effects of Cinnamon, Oregano, and Thyme Essential Oils Against *Escherichia coli* and *Trueperella pyogenes* Isolated from Dairy Cows with Clinical Endometritis	14	Elsevier
American Journal of Clinical Nutrition	1185	14680	12.4	Sugar-Sweetened Beverage Consumption and Weight Gain in Children and Adults: A Systematic Review and Meta-analysis of Prospective Cohort Studies and Randomized Controlled Trials	21	Elsevier
European Journal of Nutrition	1215	12442	10.2	Vegetarian and Vegan Diets and the Risk of Cardiovascular Disease, Ischemic Heart Disease and Stroke: A Systematic Review and Meta-Analysis of Prospective Cohort Studies	42	Springer Nature
British Journal of Nutrition	1397	9286	6.6	Increasing Dietary Levels of the n-3 Long-Chain PUFA, EPA, and DHA, Improves the Growth, Welfare, Robustness and Fillet Quality of Atlantic Salmon in Sea Cages	33	Cambridge University Press
Current Developments in Nutrition	503	2644	5.3	Relationship between Body Mass Index and Health and Occupational Performance among Law Enforcement Officers, Firefighters, and Military Personnel: A Systematic Review	10	Elsevier

Note: TP *= Total Publications,* ***TC*** *= Total Citation. MDPI: (Multidisciplinary Digital Publishing Institute).*

Table 3. Author-Level Bibliometric Profiles of Researchers Represented in the AI and Nutrition Dataset

	Author	Year of 1st Publication	(TP)	*H*-Index	(TC)	Current Affiliation	Country
01	**de Turck, Filip D.**	2002	730	51	13,289	Universiteit Gent, Ghent	Belgium
02	**Hirsch-Ernst, K.I.**	1972	810	144	90,411	McMaster University Medical Centre, Hamilton	Canada
03	**Kavouras, S.A.**	1998	187	44	6,801	Arizona State University Downtown Phoenix Campus	United States
04	**Mangelsdorf, I.**	1990	278	41	7,049	Fraunhofer Institute for Toxicology and Experimental Medicine ITEM, Hannover	Germany
05	**Naska, A.**	1997	398	74	17,438	School of Medicine, Athens	Greece
06	**Pentieva, K.**	1995	288	47	6,973	Ulster University	UK
07	**Salas-Salvadó, J.**	1983	846	111	53,248	Universitat Rovira i Virgili, Tarragona	Spain
08	**Siani, A.**	1985	386	63	20,584	Consiglio Nazionale delle Ricerche, Rome	Italy
09	**Vinceti, M.**	1992	496	72	16,658	Università degli Studi di Modena e Reggio Emilia	Italy
10	**Fulgoni, V.L.**	1980	245	60	10,978	LLC, CA	United States
11	**Gandy, J.**	1999	59	21	1,877	Ninewells Hospital, Dundee	UK
12	**Moreno, L.A.**	1990	1,140	100	63,248	Universidad de Zaragoza, Zaragoza	Spain
13	**Borowicz, P.P.**	1995	126	31	3,434	North Dakota State University, Fargo	United States
14	**Caton, J.S.**	1985	234	38	5,975	North Dakota State University, Fargo	United States
15	**Crouse, M.S.**	2015	53	13	581	USDA ARS Roman L. Hruska U.S. Meat Animal Research Center	United States

Note: TP = TP, *h*-index, and TC were obtained from Scopus author profiles and reflect overall author-level bibliometric indicators rather than corpus-specific publication counts.

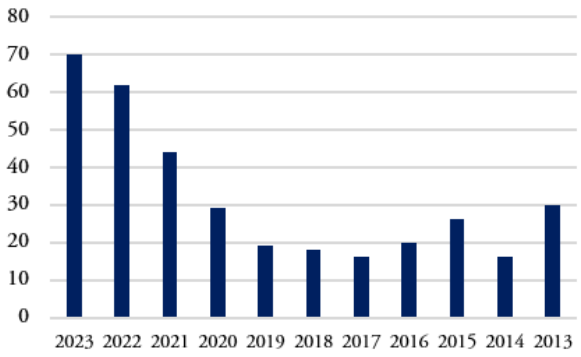

Figure 2. Distribution of Publications by Years (2013–2023)

Research Question 3 (RQ3)

What are the most productive countries in the AI and nutrition research area?

In the content analysis conducted for the most productive countries in this research field, the criteria selected included Country, Total Publications, and Most Productive Academic Institution, as presented in Table 4 and Figure 3.

Table 4. List of the 10 Most Productive Countries in AI and Nutrition Research.

Country	Educational institutions	TP
United States	Texas A and M Univ.	367
China	China Agricultural University	107
India	SRM Institute of Science and Technology, Vadapalani Campus, Chennai, India	96
Italy	Parma University	79
Canada	University of Toronto	74
Netherlands	Wageningen University	58
Spain	University Pablo Olavide and CIBERDEM	56
United States	Johns Hopkins University	49
Australia	School of Design, RMIT University	45
France	University of Pierre and Marie Curie	38

***Note: TP** = Total Publications*

Table 4 presents the most productive countries in the AI and nutrition research area, illustrating the topic distributions across top research-active countries and institutions. From a national perspective, most of the concerned countries exhibited a consistent interest in AI and nutrition research, while some nations demonstrated a more focused engagement in specific trends. The most productive country was the United States, with a total of 367 publications, primarily from Texas A and M University, followed by China with 107 publications, represented by China Agricultural University as the leading institution. India ranked third, with 96 publications, primarily from SRM Institute of Science and Technology, Vadapalani Campus, Chennai. Additionally, Italy and Canada contributed 79 and 74 publications, respectively, led by Parma University and the University of Toronto. Other key contributors in the AI and nutrition research field included the United Kingdom, Spain, South Korea, Australia, and France, with their most productive institutions as detailed in Table 4. Moreover, other prolific and productive countries in the AI and nutrition research area are also presented in Table 4.

Figure 3 illustrates the analytical results of the most productive countries in AI and nutrition research. Unlike individual institutions, the countries concerned demonstrate a broader interest in various research topics. The most productive country was the United States, followed by China and India. Additionally, Italy, Canada, the United Kingdom, Spain, South Korea, Australia, and France were identified as the top 10 countries contributing to this research field. The analysis also highlights those institutions within the same country or region with similar research interests tend to collaborate more in AI and nutrition studies.

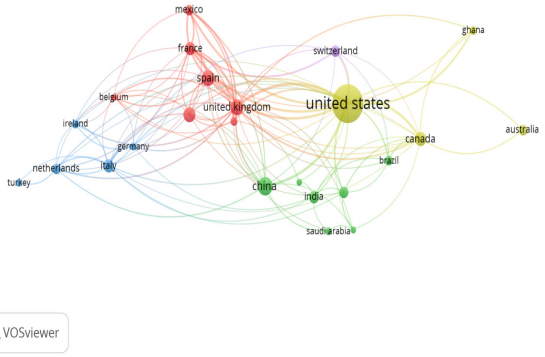

Figure 3. Analysis results of the most productive countries in AI and nutrition research

Research Question 4 (RQ4)

What are the primary research keywords concerning AI and nutrition for the last decade?

To elucidate the conceptual structure and dominant themes within the dataset, a keyword co-occurrence analysis was conducted using VOSviewer. The analysis targeted author keywords, identifying a total of 400 unique terms across the core corpus (Figure 4).

The most frequently occurring keywords centered on core nutritional parameters, dietary assessment, and computational paradigms:

- **Core Nutrition & Diet Metrics:** *"nutrition"* (Occurrences [Oc] = 134), *"diet"* (Oc = 79), *"caloric intake"* (Oc = 44), *"dietary intake"* (Oc = 42), *"food intake"* (Oc = 31), and *"nutritional assessment"* (Oc = 35).
- **Health Outcomes & Populations:** "*obesity*" (Oc = 39), "*body mass*" (Oc = 39), "*nutrition surveys*" (Oc = 37), and "*nutritional studies*" (Oc = 37).
- **AI & Computational Methods**: "*artificial intelligence*" (Oc = 74), accompanied by high-density clusters around "*machine learning*", "*nutrient adequacy*", "*public health*", and "*health monitoring*".

Approximately 60% of the analyzed corpus (n = 210) featured keyword combinations bridging nutritional monitoring with AI-driven predictive modeling. Conversely, specialized or clinical keywords—such as "*waist circumference*", "*delivery of health care*", and "*animal experiment*"—appeared less frequently, indicating that the primary focus of the field remains centered on population-level dietary assessment, dietary tracking algorithms, and personalized nutrition.

Journal Co-Citation Analysis (RQ2/RQ3)

To examine the intellectual foundation and scientific influence of publication venues, a journal co-citation network was generated using VOSviewer (Figure 5). The resulting network comprises 10 key items organized into 4 distinct clusters, with 45 inter-journal links and a Total Link Strength (TLS) of 158.

The top-cited articles within these leading co-cited venues highlight the interdisciplinary breadth of AI applications in food science and nutrition:

- ***EFSA Journal***: Led citations with landmark scientific opinions on food safety risks, such as public health risks associated with aflatoxins in food (19 citations).
- ***Journal of Animal Science***: Highlighted predictive modeling applications, notably machine learning approaches for estimating feed efficiency in livestock (13 citations).
- ***European Journal of Nutrition***: Focused on translational human health, particularly reviews evaluating current evidence for AI in personalized nutrition (10 citations).
- ***Journal of Nutrition***: Represented epidemiological methodologies, emphasizing the synergy between machine learning and dietary assessment tools (8 citations).

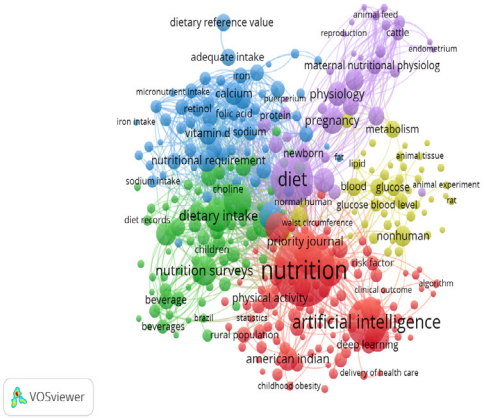

Figure 4. Analysis results of publications by keywords

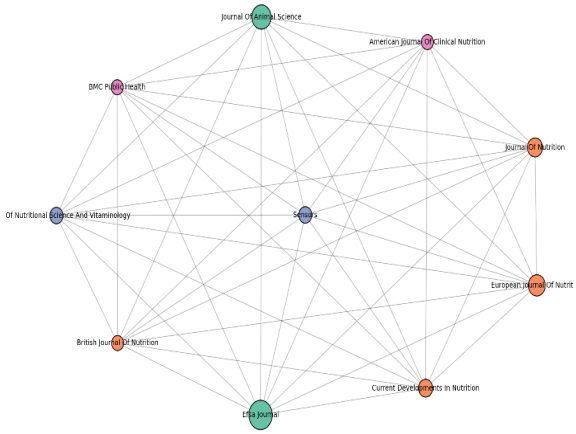

Figure 5. Most Cited Journals (Citations)

These co-citation patterns illustrate a high concentration of academic influence within a select group of flagship journals. They demonstrate that the intellectual structure of AI in nutrition is anchored in three core domains: food safety and risk assessment, precision animal/agricultural nutrition, and AI-enabled personalized human nutrition.

4 Discussions

Based on a core corpus of 350 peer-reviewed documents retrieved Scopus, this study provides a comprehensive scientometric and thematic evaluation of artificial intelligence (AI) applications in nutrition science over the 2013–2023 period. The trajectory of publication volume underscores an accelerating shift toward AI-integrated dietary assessment, positioning this domain as a rapidly expanding interdisciplinary frontier (Figure 6).

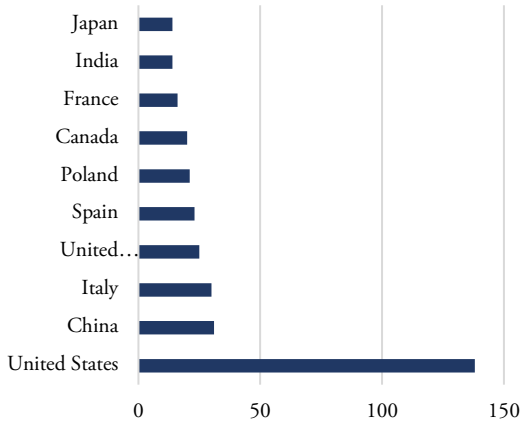

Figure 6. Country Distribution and Total Publications

The publishing outlets spanning public health, computer science, food technology, and personalized medicine reflect a broad interdisciplinary convergence. The marked publication surge observed between 2021 and 2023 can be attributed to three key catalysts:

- **Algorithmic Advancements:** Rapid developments in computer vision, deep learning, and natural language processing (NLP) expanded the feasibility of automated dietary logging and real-time nutrient recognition.
- **Post-Pandemic Digital Transformation:** The COVID-19 pandemic accelerated the adoption of digital health infrastructures, mobile health (mHealth) applications, and wearable biosensors, generating high-volume dietary and physiological datasets.
- **Precision Health Paradigms:** Growing emphasis on precision nutrition and metabolic health catalyzed cross-disciplinary synergies among data scientists, clinical dietitians, and epidemiologists.

Geographical Dominance and Collaboration Networks

The United States established a commanding lead in scientific output, accounting for nearly 40% of the analyzed corpus, with Texas A&M University emerging as prominent institutional contributor. The This geographic concentration aligns with broader bibliometric patterns in digital health and biomedical AI, where productivity strongly correlates with substantial R&D expenditure, mature digital health infrastructures, and access to large-scale longitudinal datasets. These countries benefit from extensive research funding, access to large-scale health and nutrition datasets, and established collaborations among universities, healthcare institutions, and technology sectors. Similar patterns have been reported in other bibliometric studies examining AI applications in healthcare and biomedical sciences, where research productivity is often concentrated in countries with greater technological and scientific resources.

Moreover, scientific cooperation analysis reveals that countries/regions (e.g., the United States, China, Italy, and the United Kingdom) demonstrating a superior interest in international collaboration are likely to advance more rapidly. Additionally, collaborations within the same institutions or national research centers appear to be particularly influential. This finding highlights the importance of interdisciplinary and international partnerships in accelerating scientific innovation and knowledge dissemination within emerging research domains.

Conceptual Structure and Core Research Clusters

This study identified the most relevant research topics in AI and nutrition, including AI-based dietary assessment, nutritional epidemiology, and the application of machine learning in food safety and health-related research. The co-occurrence and content analyses revealed six dominant thematic pillars defining the current AI-nutrition research landscape: (1) Automated Dietary Assessment, (2) Machine Learning in Public Health, (3) AI in Food Quality and Safety, (4) Personalized & Precision Nutrition, (5) Predictive Modeling in Chronic Diseases, and (6) Ethical Data Governance. These thematic areas reflect the increasingly multidisciplinary nature of the field and demonstrate how advances in artificial intelligence are being integrated into nutritional science to address challenges related to health promotion, disease prevention, dietary monitoring, and food system management.

5 Conclusion and Implications

The world is transforming its approach towards nutrition and health sciences through the integration of artificial intelligence technologies. To identify the major research themes and their evolution within the AI and nutrition domain, this bibliometric study mapped the ten-year evolution (2013–2023) of AI applications in nutrition across 350 publications, identifying key productivity trajectories, influential journals, leading authors, global collaboration patterns, and core conceptual domains.

The empirical findings confirm that research productivity has entered an exponential growth phase, heavily anchored by multidisciplinary venues bridging food science, medical informatics, and public health. Geographically, output remains concentrated in technologically advanced nations with robust research infrastructures, though international collaborations are expanding.

From an application perspective, the field is moving beyond simple algorithmic proof-of-concepts toward integrated systems for precision dietetics, automated dietary tracking, and predictive metabolic modeling. Establishing standardized data governance protocols and clinical validation frameworks will be essential to translate these computational innovations into safe public health policies and routine clinical dietetic practices.

Limitations and Future Directions

When interpreting the findings of this study, three main limitations should be noted:

- *Database Coverage*: Literature retrieval was restricted to the Scopus database. While Scopus offers broad multidisciplinary indexing and seamless compatibility with VOSviewer. Relying on a single database may have excluded relevant publications indexed exclusively in further databases including Web of Science (WoS), PubMed, or IEEE Xplore.
- *Indexing Latency*: Recent publications (particularly from 2024) were excluded or underrepresented due to database indexing lags, though this does not alter the overall ten-year structural trends identified.
- *Query Strategy Scope*: The search string relied on core Boolean combinations (*artificial intelligence* AND *nutrition*). While highly specific, this query may have omitted specialized studies employing niche terminology (e.g., deep learning, convolutional neural networks, food informatics, or smart dietary logging) without explicit reference to broad AI terms.

Future bibliometric investigations could expand these boundaries by executing multi-database queries (combining Scopus, PubMed, and Web of Science) and incorporating broader algorithmic key terms (*machine learning*, *predictive modeling*, *dietary computer vision*) to map the continuous evolution of digital nutrition science.

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