Herbal and Obesity in Indonesia and Malaysia: A Bibliometric Analysis

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Abstract

Obesity is a growing global health concern, contributing to a range of chronic diseases. Herbal treatments have gained attention as potential natural remedies for managing obesity due to their bioactive compounds. This bibliometric analysis aims to provide a comprehensive overview of the research trends, key contributors, and thematic areas in herbal treatments and obesity from 1988 to 2024. A comprehensive search was conducted in the Scopus database using a combination of keywords related to "herbal medicine" and "obesity." The search was limited to English-language publications and focused on Indonesia and Malaysia. A total of 393 documents were identified and analysed. Bibliometric indicators such as publication growth, co-authorship, citation impact, and co-occurrence of keywords were examined to reveal research trends and key contributors. Network analyses were performed to visualize keyword clusters and author collaborations. The analysis revealed a rapid publication growth after 2010, with an annual growth rate of over 11%. The University of Malaya and the University of Gajah Mada emerged as the leading institutions in publications and citations. Co-authorship patterns highlighted high levels of international collaboration, with an average of 5.74 co-authors per paper. Keyword co-occurrence analysis identified key themes, including animal studies, phytochemistry, and human clinical trials. Research on herbal treatments for obesity is expanding rapidly, with strong collaboration and increasing citation impact. Future studies should focus on developing clinical trials, improving methodological rigor, and enhancing cross-regional collaborations to validate the efficacy of herbal remedies in diverse populations.

Keywords: Bibliometric analysis; Clinical trials; Herbal medicine; Obesity; Phytochemistry

INTRODUCTION

The global burden of obesity has reached alarming levels, characterized by a significant increase in prevalence across various demographics and regions. The World Health Organization (WHO) has termed this phenomenon "globesity," indicating the widespread nature of obesity as a critical public health issue. Recent estimates suggest that over 1.9 billion adults are classified as overweight, with approximately 600 million of these individuals being obese[1,2]. This escalating trend is not confined to adults; childhood obesity is also on the rise, with projections indicating that the number of affected children could exceed 250 million by 2030[3].

Obesity has emerged as a significant public health challenge in both Malaysia and Indonesia, with rising prevalence rates that reflect broader global trends. In Malaysia, the prevalence of obesity has reached alarming levels, with recent estimates indicating that approximately 50% of the adult population is either overweight or obese[4]. This situation is exacerbated by lifestyle changes, including increased consumption of high-calorie foods and decreased physical activity, which are common in urbanized settings. The Malaysian National Health and Morbidity Survey reported that the prevalence of obesity among adults rose from 14% in 1996 to 30% in 2019, highlighting a concerning upward trend[5]. In Indonesia, the scenario is similarly troubling, with the prevalence of obesity among adults reported at 23.1% as of 2018, reflecting a significant increase from previous years[6,7]. The National Basic Health Survey indicated that obesity rates have doubled since 1993, reflecting significant changes in dietary habits and lifestyle choices[7].

Furthermore, childhood obesity is a growing concern, with studies indicating that rates of overweight and obesity among children have increased significantly, paralleling trends observed in Malaysia[8]. For instance, a study highlighted that the prevalence of overweight and obesity among children aged 6-12 years increased from 5.1% to 15.6% between 1993 and 2014[9].

The practice of herbal medicine in Malaysia and Indonesia is deeply rooted in cultural traditions, with many people turning to these remedies for their accessibility, affordability, and cultural significance[10-12]. This longstanding use reflects a growing trend towards traditional treatments as alternatives to conventional therapies in these regions. In both countries, herbal medicine has gained widespread popularity, with practices like Jamu in Indonesia and herbal treatments in Malaysia integral to daily healthcare for many[13]. Despite the growing reliance on these remedies, scientific validation of their effectiveness, especially for obesity, remains limited[14-16]. This cultural context highlights the need for more rigorous research, like the present study, to map the potential of herbal medicine as a viable treatment option for obesity management.

The use of herbal medicine for obesity management has garnered significant attention in recent years, as individuals seek natural alternatives to conventional pharmacotherapy. Herbal remedies are increasingly recognized for their potential to aid in weight loss and improve metabolic health, with various studies highlighting their efficacy and safety. One promising area of research involves using specific plant extracts that have demonstrated anti-obesity effects. For instance, a survey of *Cucumis melo var. gaettongchamoe* extract showed significant adiposity reduction in high-fat diet-induced obese mice, suggesting its potential as a natural anti-obesity treatment[16]. Similarly, a polyherbal formulation known as 18KHT01 has been identified as a potent anti-obesity remedy. It exhibits antioxidant properties that may help mitigate obesity-related oxidative stress and its associated disorders, such as insulin resistance and hypertension[15].

The bibliometric analysis of herbal medicine reveals a growing body of literature that underscores its significance in traditional and modern healthcare systems. Furthermore, bibliometric analysis provides valuable insights into the quality and impact of research outputs, which are critical for making funding and policy decisions in healthcare[17]. By analyzing publication metrics like citation counts and journal impact factors, researchers gain a clearer understanding of the relevance of their work within the broader scientific community[18]. As the field of herbal medicine expands, leveraging bibliometric analysis will be vital in shaping future research directions and fostering collaborations that enhance the integration of traditional knowledge into contemporary medical practice[19]. Therefore, this study seeks to understand the landscape of herbal research and obesity in Indonesia and Malaysia, addressing key questions: I) What are the trends in herbal research for obesity? II) Which authors and institutions are the leading contributors? III) What are the key research trends in this field?

METHODS

This study employs a bibliometric analysis to examine the research landscape on herbal treatments for obesity in Indonesia and Malaysia from 1988 to 2024. The Scopus database was used to collect relevant publications using a combination of keywords related to herbal medicine and obesity. The search focused on English-language publications and those specific to Indonesia and Malaysia. Initially, 14,106 documents were identified, but after applying filters for language and region, the number was reduced to 533. Further screening excluded review papers, conference papers, letters, surveys, and book chapters, focusing only on original research articles, resulting in 397 papers for final analysis. We analyzed the data using bibliometric indicators such as publication growth, co-authorship patterns, citation impact, and keyword co-occurrence. These indicators allowed us to assess trends in research output, collaboration between authors, and the thematic focus of the studies. We also conducted network analyses to visualize clusters of related keywords and the collaborative networks among researchers. The bibliometric analysis was performed using RStudio, with the application of the Bibliometrix package, a tool specifically designed for quantitative research analysis[20,21]. This software enabled us to examine key metrics such as contributing countries, influential authors, and collaborative networks. We adapted the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to outline the workflow for selecting and filtering studies (Figure 1).

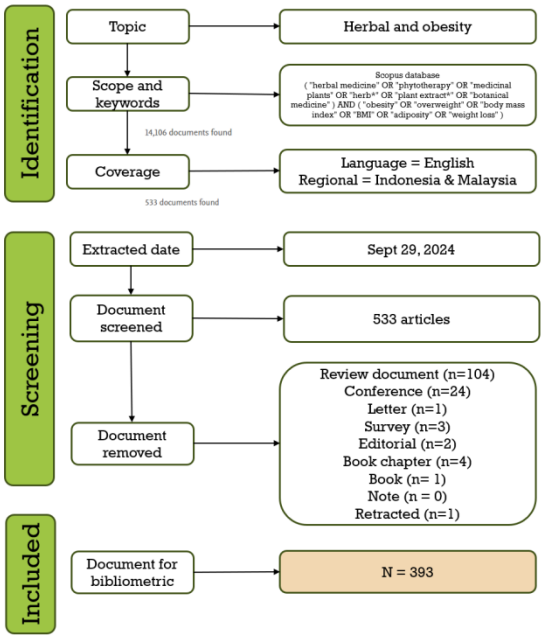

Figure 1:
Bibliometric workflow (adapted from PRISMA protocol)

RESULTS

The research on herbal treatments for obesity has seen significant growth over the past three decades, with an increasing number of studies being published each year, covering hundreds of sources and nearly 400 documents. The research field is growing at a notable rate of over 10% annually, indicating increased attention in recent years. Collaboration is strong, with a tiny percentage of single-authored papers showing a preference for teamwork. A significant portion of the publications involve international collaborations, averaging around five co-authors per document. The range of research topics is diverse, as seen by the various keywords authors use. Most documents are relatively recent, with an average publication age of just over five years, indicating a fresh and dynamic research area. The citation rate is relatively healthy, with each document referenced frequently, pointing to the relevance and impact of the studies in this domain. This growth, collaboration, and citation pattern reflects the increasing importance of the intersection between herbal treatments and obesity research (figure 2).

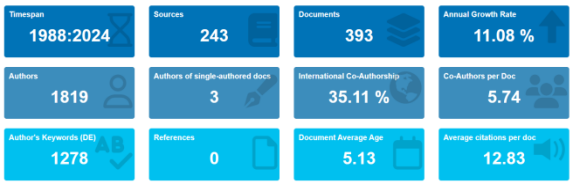

Figure 2:
General information of bibliometric results (Source: Authors bibliometric software analysis screenshot)

From the early 1990s until about 2010, research output in this field could have been more extensive. However, starting around 2010, there was a sharp increase in published articles, indicating a growing interest in this topic. The field has experienced an impressive annual growth rate of over 11%, with publications peaking in recent years. Statistical tests suggest a steady upward trend, with the Mann-Kendall test showing a positive trend despite minor fluctuations and Pettitt's test pointing to 2024 as a significant year for publication output. The rapid rise in research likely reflects the increasing interest in alternative therapies for obesity management (figure 3).

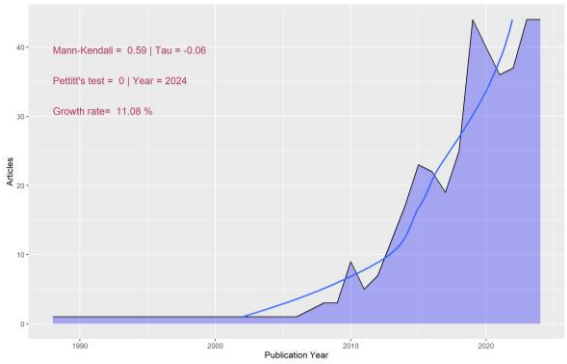

Figure 3:
Annual Scientific Production (Source: Authors bibliometric software analysis screenshot)

Regarding the top 10 most productive authors in herbal treatments and obesity, ranked by their total and fractionalized publication contributions, Ismail A is the most prolific author of total publications and fractionalized contributions, holding the top spot. Other key contributors include Abas F, Bahari H, and Saari N, who are consistently involved in many publications but with varying levels of fractionalized authorship (which adjusts for the number of co-authors). Fractionalized values give more weight to authors' contributions in collaborative works. The

figure highlights a balance between total productivity and significant individual contributions, with the top three authors (marked in blue) particularly influential in advancing research in this area (figure 4).

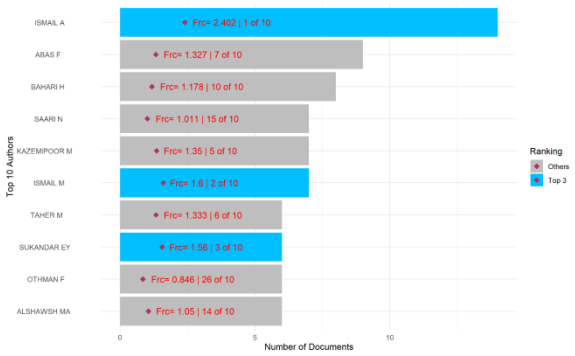

Figure 4:
The most Productive Authors (Total and Fractionalized Publication)

Related to the publication output of the top 10 most productive authors in herbal treatments and obesity over time. Each author's contributions are shown as circles on the timeline, where the size of the circles represents the number of articles published in a given year, and the color intensity (ranging from light to dark blue) indicates the total citations (TC) per year. Notably, Abas F and Ismail A were highly active during the mid-2010s. Ismail A's publications received an exceptionally high citation during this period, as indicated by the darker blue circles. Saari N and Kazemipoor M also show consistent output, although their impact in terms of citations appears to be more moderate. Other authors, such as Alshawsh MA and Sukandar EY, have fewer publications but show bursts of activity in specific years. The graph provides insights into the temporal trends of research productivity, highlighting periods of intense activity and citation impact for these leading authors. This helps illustrate who the key contributors are and when they were most influential in shaping the research landscape (figure 5).

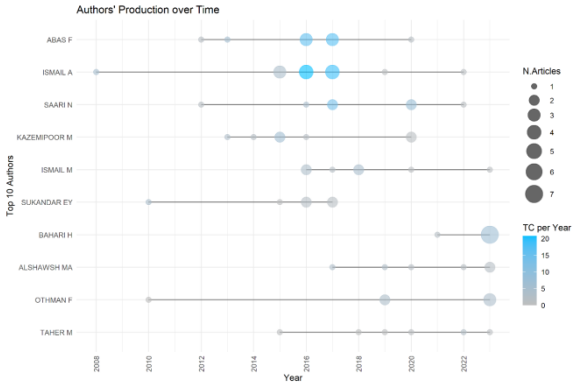

Figure 5:
The most Productive Authors over time

In conjunction with the most productive universities in research on herbal treatments and obesity, based on the number of documents published and total citations received. The University of Malaya is the leading institution in the number of publications and the highest citation count, as shown by the large red diamond marker. Universitas Gadjah Mada and Bandung Institute also rank in the top three for total publications and citations, marked by blue bars and diamonds. Other universities, such as Universitas Indonesia, Universitas Padjadjaran, and Monash University, are significant contributors, with fewer publications and lower citation counts than the top three. The red diamond icons represent each institution's total number of citations, indicating their overall impact. This visualization clearly shows the dominant role of certain universities in shaping the research landscape through high output and influence, as reflected by citation counts (figure 6).

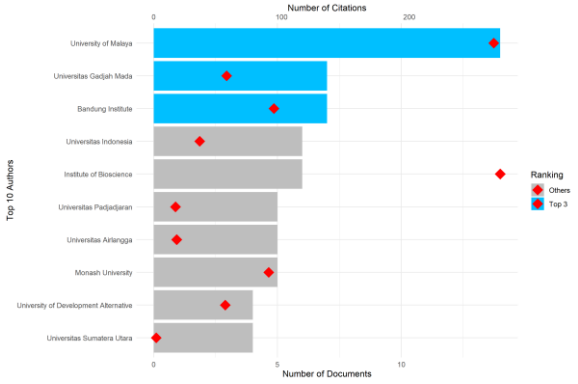

Figure 6:
The most Productive University (Total document and Citation); Red Diamond represents total citations

Associate with the co-occurrence network of keywords related to herbal treatments and obesity in bibliometric research, the network comprises clusters of terms frequently appearing in the literature, with different colors representing distinct thematic areas. Keywords like plant extract, body weight, insulin, and controlled study are central and firmly connected, indicating their prominent role in research. The green cluster seems to focus on animal studies, with terms like animal experiment, lipid diet, and body weight reflecting research on the effects of herbal treatments on obesity in animal models. The purple cluster includes terms such as plant extracts, phytochemistry, and antioxidants, highlighting herbal treatments' chemical and biological properties and their interactions. Meanwhile, the red cluster centers on human clinical trials, with terms like body mass, weight reduction, and human, pointing to studies involving obesity treatment in human subjects. This network visualization reveals the interconnectedness of various research themes, ranging from animal models to clinical studies. It emphasizes the multidisciplinary nature of research at the intersection of herbal medicine and obesity. It also shows the complexity and breadth of research, as many terms and concepts span basic and applied sciences (figure 7).

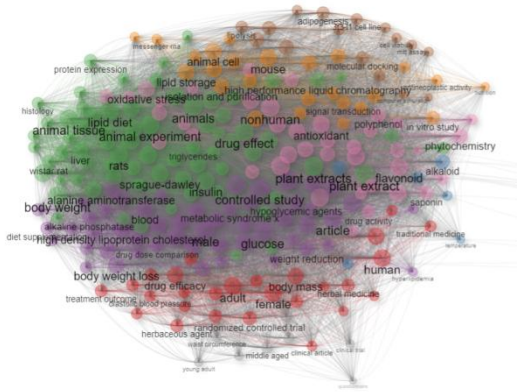

Figure 7:
Co-occurrence network of Herbal and Obesity Bibliometric

DISCUSSION

The bibliometric analysis highlights the growing interest in the intersection between herbal treatments and obesity research. The sharp increase in publications since 2010, as shown in the annual production graph, indicates an escalating focus on exploring alternative and natural remedies for obesity management. The high annual growth rate (over 11%) suggests that this field has gained significant traction, likely driven by the global obesity epidemic and the rising interest in integrative and complementary medicine. The surge in research output also points to increasing recognition of herbal treatments' potential efficacy in managing obesity and related metabolic conditions. The data on authorship and institutional contributions further demonstrate the collaborative and international nature of research in this area. The high levels of co-authorship, particularly in the top productive authors and institutions, suggest that researchers work across disciplines and borders to address this complex health issue. The University of Malaya is the most influential institution regarding output and citation impact. Southeast Asia, particularly Malaysia and Indonesia, has become a significant hub for research on herbal treatments, possibly due to the region's rich medicinal plant use and biodiversity tradition[13,22].

Keyword co-occurrence analysis reveals several important themes in the field. One key finding is the strong presence of terms related to animal models and plant extracts, highlighting the foundational role of preclinical research in this area. Studies on animals help elucidate the mechanisms through which various herbal compounds affect metabolic processes, such as lipid metabolism, oxidative stress, and insulin sensitivity. These animal experiments are crucial for establishing the scientific basis of herbal treatments before they can be tested in human clinical trials. The network also shows the increasing integration of phytochemistry, emphasizing that the chemical properties of plant extracts (e.g., flavonoids and alkaloids) are essential in understanding their therapeutic potential[10]. Another critical theme that emerges is the focus on human clinical trials and the impact of herbal treatments on obesity-related outcomes like body mass index (BMI), weight reduction, and glucose regulation. While animal studies provide initial insights, the shift toward clinical trials indicates a growing effort to translate these findings into practical treatments for human populations. These studies are essential for confirming the safety and efficacy of herbal remedies in diverse populations, which will be key to their wider acceptance and use in obesity management protocols. The collaboration patterns in this research field also highlight the importance of global cooperation. The significant levels of international co-authorship indicate that researchers pool knowledge and resources across countries to address obesity, a worldwide health crisis. This trend

is particularly notable in the top authors' analysis, where few single-authored papers exist, underscoring the multidisciplinary approach needed to tackle obesity from multiple angles, including biochemistry, pharmacology, nutrition, and clinical medicine. Lastly, the strong citation impact of the top authors and institutions suggests that the research in this field is prolific and influential. The high average citation per document (around 12.8 citations) points to the relevance and importance of the studies in shaping current understanding and future research directions. As herbal medicine continues to gain acceptance as a potential treatment for obesity, the growing body of literature will likely have a lasting impact on clinical practice and public health policy, particularly as more high-quality, peer-reviewed studies are conducted. Bibliometric analyses such as this will be essential in identifying gaps, directing future research efforts, and fostering the integration of traditional knowledge into modern medical practices[20].

Several key areas warrant further investigation to advance the application of herbal treatments for obesity management. First, future studies should prioritize large-scale, randomized clinical trials to confirm the efficacy and safety of specific herbal compounds in human populations[23,24]. These trials should include diverse demographic groups to ensure the generalizability of results across different cultural and ethnic contexts. Additionally, standardization in herbal treatment protocols—such as dosage, formulation, and treatment duration—is critical to facilitate comparison between studies and improve clinical reproducibility[25].

Moreover, the long-term effects of herbal treatments on obesity, including their role in sustained weight loss and metabolic improvements, remain underexplored. Longitudinal studies are needed to assess the lasting impact of herbal remedies on obesity-related outcomes such as insulin resistance, cardiovascular health, and diabetes risk[19,26,27]. Integrating modern techniques like genomics and metabolomics into future research could also uncover the specific molecular mechanisms by which these herbs affect metabolic pathways, providing a more targeted approach to treatment[28,29]. Applying these findings could significantly expand the role of herbal medicine within integrative healthcare models[22]. As natural remedies continue to gain popularity as complementary therapies, a deeper understanding of their mechanisms and long-term benefits could help bridge the gap between traditional medicine and modern clinical practices. In doing so, herbal treatments could become essential in global obesity management strategies, offering a natural, accessible, and culturally relevant alternative to conventional pharmacological interventions.

Despite the promising growth in research on herbal treatments for obesity, several limitations in the current body of literature need to be addressed. One major issue is the over-reliance on preclinical studies, particularly in animal models, which may not always translate effectively to human populations due to differences in metabolic processes[15]. While animal studies provide valuable insights into potential mechanisms, there is a need for more clinical trials involving diverse human populations to validate the efficacy of herbal treatments[16,17]. Another limitation is the geographic concentration of research largely focused on Southeast Asia. Expanding research to other regions would help ensure that findings are generalizable to a wider variety of cultural and ethnic contexts[18]. Furthermore, methodological inconsistencies—such as variations in dosage, plant extracts used, and study designs—make it challenging to compare results across studies, as noted in previous reviews[19,25]. Finally, developing standardized protocols would improve the reliability and comparability of future research.

The bibliometric analysis provides a comprehensive overview of the research landscape surrounding herbal treatments and obesity. The steady growth in publications, international solid collaboration, and increasing focus on human trials signal that this field is moving toward more practical, real-world applications. The challenge moving forward will be to ensure that this growing body of research translates into safe, effective, and widely accessible treatments for obesity, a critical public health issue.

CONCLUSION

This study maps a comprehensive bibliometric analysis of research trends in herbal treatments for obesity in Indonesia and Malaysia over the past three decades. Our findings reveal a rapidly expanding field, with increased international collaboration and strong growth in publication output. Institutions such as the University of Malaya and Universitas Gadjah Mada have emerged as key contributors to this growing body of literature, and the rising citation impact reflects the growing significance of herbal medicine research in managing obesity. While the current research highlights the potential of herbal treatments for obesity management, there remain critical gaps,

particularly in rigorous clinical trials and standardized methodologies. Future studies should focus on validating the efficacy of these treatments in diverse human populations, developing consistent protocols, and exploring the long-term effects of herbal remedies on metabolic health. The growing interest in this field underscores the importance of integrating traditional knowledge with modern scientific approaches. Herbal medicine, with its cultural relevance and accessibility, holds promise as a complementary strategy in global obesity management. As research continues, herbal treatments may offer valuable, natural alternatives to conventional obesity therapies, contributing to more holistic healthcare solutions.

CONFLICT OF INTEREST

Authors declare no conflict of interest

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