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Twenty Years of Bibliometric Analysis for Halal Pharmaceutical Research

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ABSTRACT

This research employed five bibliometric indicators to analyse the progress of halal pharmaceutical research. It investigated (1) the current state and distribution, (2) explored topics, (3) primary contributors, (4) patterns of collaboration, and (5) influential documents in the field. The study analysed 193 documents from the Scopus database until 2022, utilising tools such as Microsoft Excel, VOSviewer, and Biblioshiny. The findings revealed a notable and consistent increase in halal pharmaceutical publications over the past decade, focusing on Islamic marketing, food research, and applied pharmaceutical science in Malaysia, Indonesia, and Iran. Frequently used keywords include halal, gelatine, halal pharmaceuticals, attitude, and chemometrics. Malaysia, Indonesia, Saudi Arabia, and the USA emerged as key contributors to collaborative halal pharmaceutical research. The research's outcomes are significant for advancing global practices and research in halal pharmaceuticals.

Keywords: Halal pharmaceuticals; Bibliometric analysis; VOSviewer; Biblioshiny; Pharmacy

1 Introduction

The paramount focus should be safeguarding health, as consuming harmful non-halal pharmaceuticals can prove fatal. To create awareness, the Ministry of Science, Technology, and Innovation, in collaboration with the Department of Standards Malaysia, has issued comprehensive guidelines for halal pharmaceuticals, ensuring *Shari'ah* compliance [1]. The thriving halal pharmaceutical market is predicted to achieve USD 174.59 billion by 2025, driven by robust support from the Islamic demographic and an upswing in Muslim consumer spending [2]. While the concept of halal pharmaceutics emerged in 1987, a systematic analysis of research trends in this field has been lacking until now [3]. However, a forthcoming study seeks to address this gap by analysing bibliographic data.

This study focused on the bibliometric analysis of halal pharmaceutical-related scientific publications hoping to answer the following research questions (RQs):

RQ1: What is the current development of halal pharmaceutical research and its distribution?

RQ2: What are the topic areas and themes in halal pharmaceutical research?

RQ3: Who are the main contributors to halal pharmaceutical research?

RQ4: What is the current collaboration pattern in halal pharmaceutical studies?

RQ5: What are the most influential documents in halal pharmaceutical literature?

2 Methods

2.1 Data Source

The study utilised bibliometric analysis, employing quantitative and statistical methods to assess the distribution of articles related to halal pharmaceuticals. For data collection, the researchers turned to the Scopus database, renowned for its advanced search function, extensive coverage of over 7000 publishers globally, and rigorous article quality standards. The database encompasses 26,591 peer-reviewed journals, including Gold Open Access journals, trade journals, book series, conference papers, and titles from diverse subject clusters such as social sciences, physical sciences, health sciences, and life sciences [4]. With a comprehensive approach, the analysis examined 193 relevant documents and identified them through predefined keywords to gain comprehensive insights into halal pharmaceutical studies on a global scale.

2.2 Data Collection

The research process commenced with a thorough search in the Scopus database for articles containing the keywords "halal" or "Islamic" AND "pharmaceutical" within their titles, abstracts, and keywords. The study encompassed all 193 documents retrieved from the database covering the period from 2002 to 2022, as of June 2023. The comprehensive search ensures that all obtained documents are directly relevant to halal pharmaceuticals, including all 193 articles in this bibliometric study, without exclusions during the screening phase.

2.3 Data Analysis

This study utilised multiple tools, including the Scopus database for data analysis, Microsoft Excel for calculations and visualisations, Biblioshiny for bibliometric analysis [5], and VOSviewer for network mapping [6]. The research strategically addressed the formulated research questions (RQs). RQ1 is answered by analysing publications based on year, source, and document type. RQ2 is explored through subject areas and author keywords. RQ3 is addressed by visualising co-authorship networks among authors and countries. Lastly, RQ4 is answered by presenting the top 10 highly cited documents.

3   Results & Discussion

3.1 Development of Halal Pharmaceutical and its Distribution

Figure 1 illustrated the annual publication statistics of halal pharmaceutical research spanning 2002 to 2022, indicating a substantial annual growth rate of 11.91%. Notably, the research experienced a significant surge in 2012, whereas limited publications were observed from 2002 to 2011, averaging approximately 6 documents per year. Furthermore, the field's origination from Arab scholars gradually expanded to include countries in Southeast Asia, North America, Australia, and Europe.
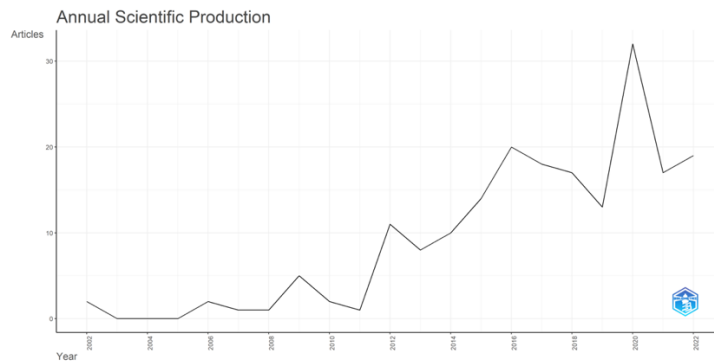

Figure 1: *The growth of halal pharmaceutical studies from 2002-2022.*

3.2 Topic Areas

This analysis delved into halal pharmaceutical research topics, exploring subject areas and the author's keywords. The study used VOSviewer software to build a bibliometric network, as showcased in Figure 2. The colour, circle size, text size, and thickness of the connecting line show associations with other terms. Keywords of the same colour, for example, are frequently included together. The network highlighted "halal" as the most frequently associated keyword, interconnected with terms like gelatine, halal pharmaceuticals, attitude, chemometrics, halal authentication, and pharmaceutical products. The network visualisation map revealed 20 items within 5 clusters, featuring 46 links and a total link strength of 94.
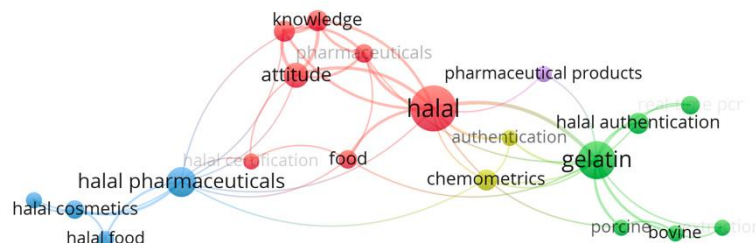

Figure 2: *Network visualisation map of author keywords for halal pharmaceutical literature.*

3.3 Most Productive Contributors in Halal Pharmaceutical Studies

Indonesian researchers stood out with 20 publications, notably led by Abdul Rohman from Universitas Gadjah Mada with 10 publications. Following closely was Parisa Ziarati from Islamic Azad University with 8 publications and Yuny Erwanto from Universitas Gadjah Mada with 6 publications, showcasing their productivity in halal pharmaceutical literature.

Most halal pharmaceutical studies focused on the Asian region, signalling an opportunity for researchers from diverse nations to collaborate and advance research in this area. It is essential to recognise that research on halal pharmaceuticals need not be confined to Muslim-majority countries.

3.4 Collaboration Patterns

This study presented a network visualisation of co-author mapping based on authors' affiliated countries (Figure 3), utilising a fractional counting approach. All countries with at least 1 document were included, regardless of the citation count. The map's colour coding, circle size, text size, and connecting line thickness indicate the strength of country associations. The map highlighted all main clusters; . The cluster in green revealed Malaysia's robust collaborations with Indonesia, Australia, and Iran (from the documents analysed).
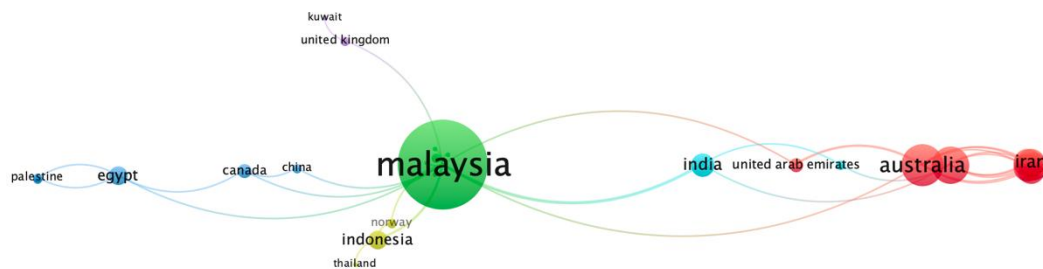

Figure 3: *Network visualisation map of co-authorship among countries.*

3.5 Most Influential Documents

Topping the list is Mukhtar & Butt's pioneering study titled "Intention to Choose Halal Products: The Role of Religiosity"[7], which stood out for being the first to evaluate human psychological factors in halal product selection. Additionally, other highly cited studies on various aspects, such as attitudes towards halal pharmaceutical products [8], halal manufacturing and warehousing [9], pharmaceutical authentication techniques [10], pharmaceutical extraction methods [11], and pharmaceutical products [12].

4 Conclusions

This research delved into the evolution of halal pharmaceutical research spanning two decades, originating in Switzerland in 2002 and gradually disseminating from Arab scholars to Asia, Africa, and Europe. Between 2012 and 2022, the field experienced significant growth, primarily focusing on life sciences and social sciences, particularly in Asian regions. Key areas of interest revolved around pharmacology, toxicology, pharmaceutics, agricultural and biological science, biochemistry, genetics, and molecular biology. Popular keywords include gelatine, halal authentication, chemometrics, porcine, bovine, halal pharmaceuticals, cosmetics, food, and pharmaceutical products. Additionally, researchers in the social science domain concentrated on attitudes, knowledge, and perceptions regarding halal pharmaceuticals. Collaboration in halal pharmaceutical research centred around Malaysia, Australia, India, Indonesia, and Egypt, with limited involvement from North Africa, America,

and Europe. While the study acknowledges its reliance on the Scopus database and keyword usage, it sheds light on halal pharmaceutical research trends. It opens avenues for further exploration in this domain, complementing existing findings through bibliometric methods.

Author Contributions

All authors significantly contributed to the paper. Conceptualisation, Nur Leyni Nilam Putri, J. and Nor Saadah, M.N.; methodology, Nur Leyni Nilam Putri, J. and Nor Saadah, M.N.; software, Nur Leyni Nilam Putri, J. and Nor Saadah, M.N.; validation, Nur Leyni Nilam Putri, J., Nor Saadah, M.N., Noor Yuslida, H.; formal analysis, Nur Leyni Nilam Putri, J. and Nor Saadah, M.N.; resources, Nur Leyni Nilam Putri, J.; data curation, Nor Saadah, M.N.; writing—original draft preparation, Nor Saadah, M.N.; writing—review and editing, Noor Yuslida, H. All authors have read and agreed to the published version of the manuscript.

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