Bibliometric analysis of publications by top 10 Indonesian universities ranked by QS World University Rankings 2022 indexed in PubMed.gov database

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Abstract---This research aims to visualize metadata of publications (authors, affiliations, keywords, and collaborative countries) authored by Indonesian academics and researchers from top 10 Indonesian universities according to QS World University Rankings in 2022. This study employed a bibliometric approach using a web-based application namely Biblioshiny to generate bibliometric map of metadata. PubMed.gov website was used as the database. The findings revealed that the published documents in PubMed.gov by top 10 Indonesian universities reached 6,327 items, authored by 21,629 academics and researchers, and published in 1,785 sources from 1974 to 2021. Based on the findings, Acta Medica Indonesiana was the most preferred Scopus-indexed journal by Indonesian authors, Gunadi was the most prolific author (n=64), Syam AF was the most collaborative author with 10 countries, and Universitas Indonesia was the most collaborative university among top 10 Indonesian affiliations. In addition, the most frequently occurring authors' keyword was "humans" starting from 2020 at the time of COVID-19 pandemic, and the most consistent keyword was "magnetic resonance spectroscopy", appearing for 17 years from 2003 to 2019. This study discovered interesting findings on publications by top 10 Indonesian-based institutions. Academics and researchers may benefit from the findings since they shed light on current medical studies and identify research needs in this field.

Keywords---bibliometric analysis, Indonesian universities, PubMed, QS World University Rankings.

Introduction

The QS World University Rankings is an annual university ranking issued by Quacquarelli Symonds (QS). The QS system consists of three components: the global overall ranking, the subject rankings, which identify the world's leading universities for the study of 51 distinct subjects and five composite faculty areas, and five independent regional tables, namely Asia, Latin America, Emerging Europe and Central Asia, the Arab Region, and BRICS (Universities, 2011). There were 16 Indonesian institutions included to the QS World University Rankings in year of 2022, namely: Universitas Gadjah Mada, Universitas Indonesia, Institut Teknologi Bandung, Universitas Airlangga, Institut Teknologi Sepuluh November, Universitas Padjajaran, Binus University, Universitas Diponegoro, Telkom University, Universitas Brawijaya, Universitas Hasanuddin, Universitas Andalas, Universitas Muhammadiyah Surakarta, Universitas Sebelas Maret, and Universitas Sumatera Utara (Symonds, 2021).

Citation per faculty, which evaluates research impact by dividing the total number of citations obtained by a university's research papers over five years by the number of faculty, is one of the variables used to determine a university's ranking (D'Souza, 2021). Citation per faculty can be increased by increasing productivity of faculty members, which means the university should encourage lecturers and students to have publications in reputable sources, represented by Scopus-indexed journals, and use universities' names as the affiliations. Consequently, the number of academic and research publications in university will indirectly impact its rank according to QS World University Rankings.

The National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM), one of the National Institutes of Health (NIH), produced PubMed database. The database was developed to access abstracts (citations) from biomedical journal articles. Subsequently, a linking capability was implemented to facilitate access to full-text journal articles on the websites of participating publishers and other relevant web resources. PubMed is the bibliographic component of the Entrez retrieval system maintained by the NCBI (Goeckenjan et al., 2011).

This paper focused on mapping publications' metadata in term of authors, sources, affiliations, and countries published by authors from top 10 Indonesian universities based on PubMed.gov database. The finding provided broader picture of publications by 10 highest rank Indonesian universities according to QS World University Rankings in 2022.

Method

This study is a literature-based descriptive study involving a bibliometric analysis. I extracted publications authored by top 10 Indonesian universities-affiliated authors from PubMed.gov database. I used query "((((((((("universitas gadjah mada"[Affiliation]) OR ("universitas indonesia"[Affiliation])) OR ("institut teknologi bandung"[Affiliation])) OR ("universitas airlangga"[Affiliation])) OR ("institut pertanian bogor"[Affiliation])) OR ("institut teknologi sepuluh november"[Affiliation])) OR ("universitas padjajaran"[Affiliation])) OR ("binus

university"[Affiliation])) OR ("universitas diponegoro"[Affiliation])) OR ("telkom university"[Affiliation])" to filter the documents indexed in PubMed.gov. By applying this query, I found that the number of publications reached 6,327 documents, published in 1,785 sources, and authored by 21,629 academics and researchers. Publications' metadata of these documents (authors, sources, affiliations, and keywords) were analyzed using web-based bibliometric mapping application namely Biblioshiny. This app can be freely accessed from https://bibliometrix.org/.

Result and Discussion

Publication by year

I found that documents by top 10 Indonesian universities-affiliated authors were first published in 1974 with only two documents. However, significant increase was found during the last ten years, starting from 2011 with 11 publications to 2021 with 2,126 documents. The annual growth of publications reached to 26.15% during the period time.
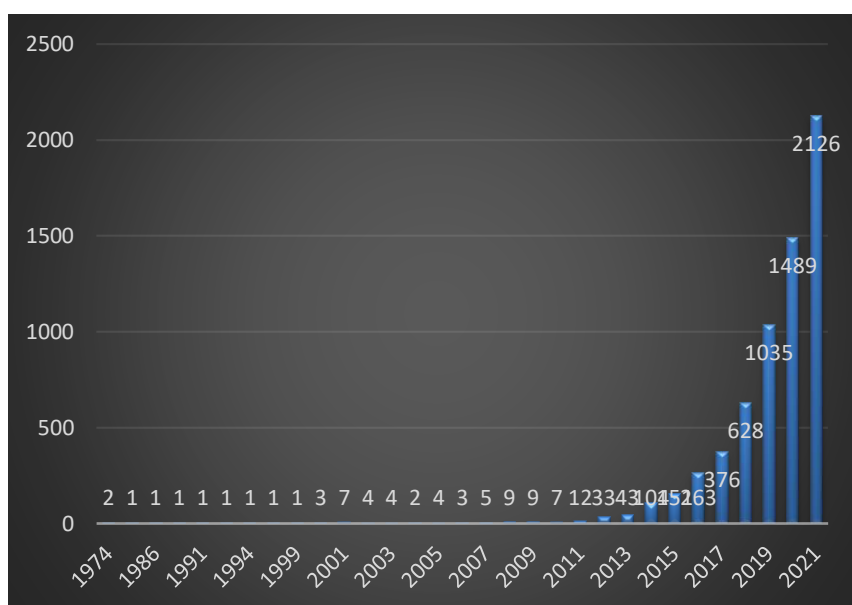

Figure 1. Year-wise publications by top 10 Indonesian affiliations

Sources, authors, and affiliations

I analyze the most favourite sources by authors from top 10 Indonesian universities and the most prolific authors within the dataset. 10 most favourite sources for publishing articles were Scopus-indexed journals namely Acta Medica Indonesiana (n=303), Heliyon (n=179), Veterinary World (n=154), Plos One (n=149), International Journal of Surgery Case Reports (n=142), Asian Pacific Journal of Cancer Prevention (n=121), Annals of Medicine and Surgery (n=109), Journal of Public Health Research (n=95), Journal of Basic and Clinical Physiology and Pharmacology (n=89), and F1000Research (n=78). Furthermore,

the most prolific authors during 1974 to 2021 were Gunadi, Pranata R, Setiati S, Aryandono T, Syam AF, Yunihastuti E, Fauzi AR, Anwar SL, Miftahussurur M, and Abdullah M. I also analyze the most collaborative university among the top 10 affiliations using "Collaboration network by affiliations" feature from R-based Biblioshiny app. Size of nodes indicated number of collaborations. The bigger of its size, the more of collaborations were made. Finding in this study showed that Universitas Indonesia was the top among others, followed by Universitas Gadjah Mada, Universitas Airlangga, Faculty of Medicine Universitas Indonesia, Sardjito Hospital, Institut Teknologi Bandung, and Cipto Mangunkusumo General Hospital.
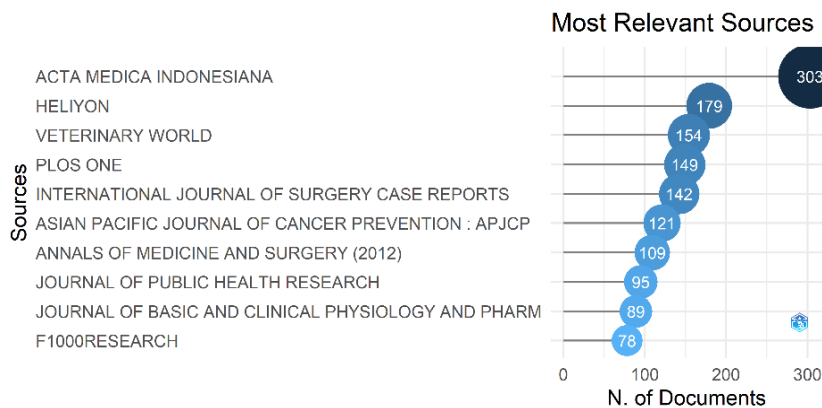
Figure 2. Top 10 sources of publications selected by the authors

Table 1. The 10 most prolific authors in producing documents

No.	Authors	Articles	Articles fractionalized
1	GUNADI	64	11,10
2	PRANATA R	56	10,42
3	SETIATI S	49	11,62
4	ARYANDONO T	44	8,44
5	SYAM AF	44	8,60
6	YUNIHASTUTI E	42	5,85
7	FAUZI AR	41	8,46
8	ANWAR SL	39	8,21
9	MIFTAHUSSURUR M	39	6,67
10	ABDULLAH M	38	5,79

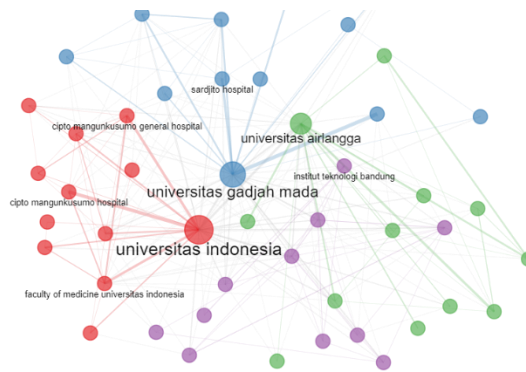Figure 3. The most collaborative Indonesian-based affiliations

Three-fields plot

I analyzed publications metadata (authors, countries, and keywords) using three-fields plot feature from Biblioshiny app. The three-fields plot below showed visualization of publications by top 10 authors in collaboration with other countries and published in journals as the sources type with the most frequently appeared keywords. The left field were the most productive authors, the middle were countries, and the right field were keywords indicating specific topics. The most collaborative author, in terms with other countries, is Syam AF with 10 countries, followed by Yunihastuti E and Abdullah M (n=9), Setiati S (n=7), Miftahussurur M (n=6), Gunadi, Aryandono T, and Pranata R (n=4), and Anwar SL and Fauzi AR (n=2). Nine most collaborative countries with Indonesia were Australia occupied the first position, followed by Netherlands, Japan, China, USA, Malaysia, Thailand, Germany, and India. The 10 most frequently used keywords by the authors in their documents were "humans", "female", "male", "adult", "middle aged", "Indonesia", "animals", "adolescent", "indonesia/epidemiology", and "cross-sectional studies". The most occurred keyword was "humans" as shown in the size of rectangles appeared on the right side. The authors were most concerned on producing humans-related research publications.
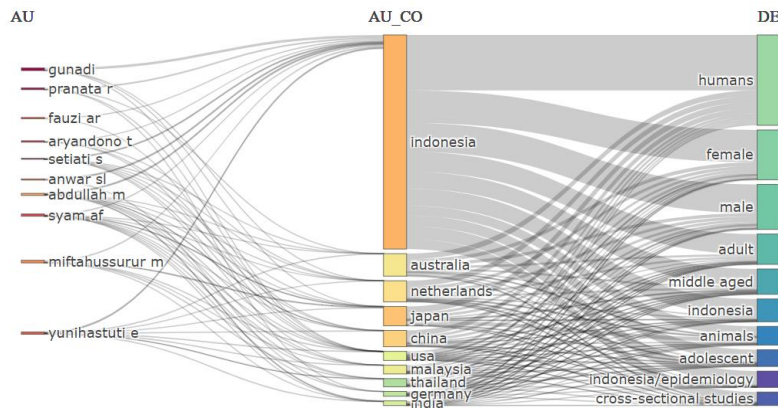

Figure 4. Visualization of collaboration network by Indonesian authors with other countries in producing documents with specific keywords
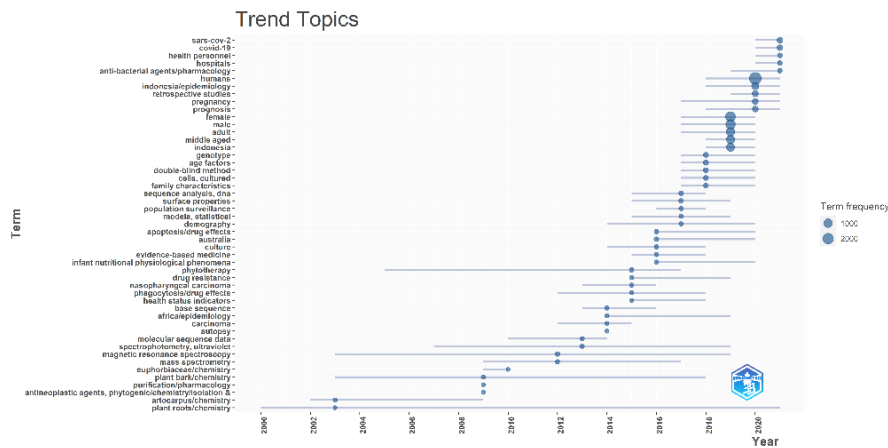
Wordcloud visualization

By giving a wordcloud visualization of the writers' keywords, it was confirmed that "humans" were the most frequently discussed keyword. The size of words in wordcloud depends on their appearance within the publications. The bigger its size, the more appeared in the documents. The most occurring word in this study was "humans" which is similar to the three-fields plot result, followed by female, male, and other keywords as shown in Figure 5.

Figure 5. Wordcloud visualization of authors' keywords

Trend topics visualization

Trend topics feature from Biblioshiny app provided the trend of publications. The authors' keywords were used with five appearances each year as the threshold. The trend of research conducted by Indonesian authors was changed year by year. The size of dots in Figure 6 related to the number of keywords' frequency in one year. None of keywords was appeared with a minimum of 1,000 times during 1974 to 2018, while in 2019 to 2021 several terms were viral to be researched with a minimum of 1,000 appearances, namely: "male" in 2019 (n=1383), "female" in 2019 (n=1564), and 'humans" in 2020 (n=2849). Term "COVID-19" referred to the global pandemic in 2021 (n=119). Term "humans" seems appeared to be the most popular term for authors in 2020 due to the impact of COVID-19 on the human body, as COVID-19 spread for the first time in this year. The term " magnetic resonance spectroscopy" appears to have the longest span of 17 years, beginning in 2003 and ending in 2019.

Figure 6. Trend topics visualization of publications indexed in PubMed.gov by Indonesian authors during 1974 to 2021

Thematic map

The authors' keywords were classified into four quadrants, namely: niche themes, motor themes, emerging/declining themes, and basic themes. These quadrants are divided based on development degree (density) and relevant degree (centrality). Niche themes in upper left included several keywords: "animals", "mice", and "rats". These keywords have high density but low centrality. Top right category is motor themes which included "humans", "Indonesia", and "cross-sectional studies". These keywords were the most progressing terms as indicated by high density and centrality. Lower left is emerging or declining themes which grouping terms "adolescent", "child", and "infant" into one quadrant. This area needs to be further researched by Indonesian authors, indicated by low development degree (density) and relevance degree (centrality). The last quadrant in lower right is consisted of terms "female", "male", and "adult" with high centrality but low density.
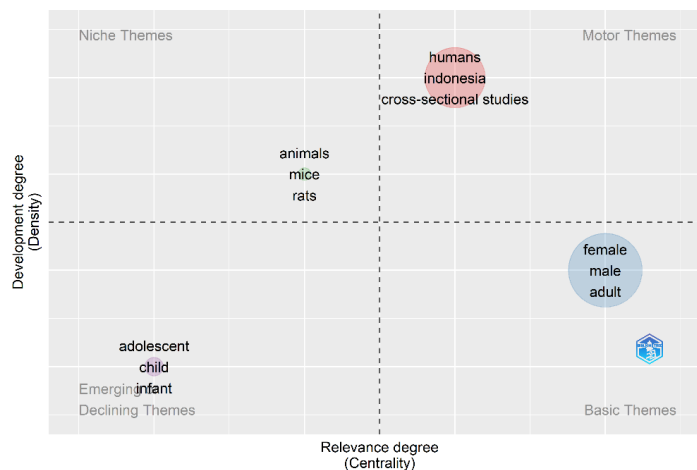

Figure 7. Thematic map of authors' keywords

Key Results

This study employed a bibliometric approach to analyze the metadata of observed publications. An R-based Biblioshiny app was used to carry out a bibliometric analysis with all documents were indexed in PubMed.gov database. This research found several interesting findings on publication by the 10 highest ranked universities in Indonesia. First, the observed documents reached 6,327 publications, authored by 21,629 academics and researchers in collaboration among top 10 Indonesian universities with other affiliations worldwide, and published in 1,785 sources. The annual growth of publications is 26.15% with significant increase occurred during the last ten years, starting from 2011 to 2021. Second, top 10 sources by the authors were Scopus-indexed journals with Acta Medica Indonesiana ranked as the most favourite journal for publication. This journal is published by the Indonesian Society of Internal Medicine from Indonesia, categorized into Q3-Scopus indexed journal with SJR 2021 of 0.31. Third, Gunadi was ranked as the most productive researchers among others with 64 published documents. Interestingly, he was not ranked as the most collaborative author with other countries. The author only produced publications with Indonesian and three states outside the nation. Meanwhile, Syam AF was ranked as the most collaborative author with 10 countries, namely: Indonesia, Australia, Netherlands, Japan, China, USA, Malaysia, Thailand, Germany, and India. Fourth, I found that the most productive affiliation is Universitas Indonesia, followed by Universitas Gadjah Mada, Universitas Airlangga, and others. In addition, the authors not only used their universities' names as the affiliations in published documents, but also the names of faculties and universities hospitals. Fifth, the finding of three-fields plot, wordcloud visualization, and trend topics visualization showed that term "humans" was the most frequently appearing word within the publications. Surprisingly, the term "humans" with a threshold of five appearances in one year was only found starting from 2020 when the COVID-19 pandemic began to spread worldwide. It seems researchers from top 10 Indonesian universities more concerned to research the impact of COVID-19 on human body. Sixth, the trend topics visualization discovered that term "magnetic resonance spectroscopy" was the most consistent keyword appeared for 17 years, from 2003 to 2019. Finally, according to thematic map, "adolescent", "child", and "infant" need to be further researched by Indonesian authors as it is indicated to have low development degree.

Conclusion

This study captured broader pictures of publications by top 10 Indonesian universities ranked by QS World University Rankings in 2022. The findings might benefit academics and researchers by providing insight on current medical studies and finding research gaps in this field. This research has one limitation. The observed documents were only publications indexed in PubMed.gov which indicating research is only on medical studies.

Acknowledgments

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