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The Effect of *Moringa oleifera* Leaf Decoction on Blood Pressure in Patients with Hypertension (GFS) from 2020-2024: A Bibliometric Analysis

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ABSTRACT

This study aims to determine the effect of Moringa oleifera on blood pressure in hypertensive patients. This research focuses on 1) How is the development of research on the relationship between Moringa oleifera and hypertension from 2020-2024. 2) the author with the most research citations related to the relationship between Moringa oleifera and hypertension from 2020-2024, and 3) which publisher institutions are the destination for researchers on the relationship between Moringa oleifera and hypertension from 2020-2024 to be published. This type of research is qualitative research with bibliometric analysis method using PRISMA method. Data sources from google scholar with search results identified 1002 articles. Articles that met the inclusion and exclusion criteria consisted of 558 articles which were then analyzed with vosviewers. The results of the analysis showed that the trend of research on the effect of moringa oliefera on hypertension fluctuated in 2023 (143 articles) with a percentage of 25.6%. Research on the relationship of Moringa oleifera to hypertension is published in reputable international journals around 42.6%. While other researchers published their articles outside of reputable international journals as many as 320 with a percentage of 57.3%. While the author with the most citations is Lili Yang (2020). Research suggestions need to be re-analyzed by involving more accurate databases such as Scopus, WoS, and Taylor and Francis.

Keywords:

Bibliometric Analysis; Hypertension; Moringa oleifera

INTRODUCTION

Hypertension, widely known as high blood pressure, is one of the degenerative diseases or non-communicable diseases that often appear without obvious symptoms. Runner and Suddarth explain that hypertension is often referred to as the "silent killer" because it can cause death without being noticed, so sufferers may not realize that they have hypertension (Nst et al., 2023) Hypertension is a medical condition in which a person's blood pressure consistently exceeds normal limits. In the case of hypertension, systolic blood pressure reaches 140 mmHg or more, and diastolic blood pressure reaches 90 mmHg or more (Srianjani et al., 2023).

According to WHO data in 2015, the number of people with hypertension in the world reached 1.13 billion people. In the African region, the highest prevalence of hypertension reaches 27%, while Southeast Asia occupies the 3rd position with a prevalence of 25%. This number continues to grow every year in people with hypertension, it is estimated that by 2025 there will be 1.5 billion people suffering from hypertension. It is also estimated that every year around 10.44 million people die from hypertension and its complications (Nst et al., 2023).

In the Southeast Asian region, Indonesia is ranked 6th with a prevalence of hypertension of 24%. Based on data from the Basic Health Research of the Republic of Indonesia (2018), hypertension in Indonesia is still a health problem with a prevalence that is still quite high at 34.1%. The incidence of hypertension in West Nusa Tenggara (NTB) is ranked 15th out of 37 provinces in Indonesia with a prevalence of 27.8%. (Dinda Furqonnisa Maligan et al., 2023). Various efforts have been made to reduce blood pressure in patients with hypertension, both with pharmacological and non-pharmacological therapies. Non-pharmacological management to reduce blood pressure can be done with a healthy lifestyle such as increasing consumption of vegetables and fruits, calium intake, quitting smoking, losing weight, reducing salt consumption, increasing physical activity by exercising, managing stress, and herbal therapy using plants.(Susilo & Wulandari, 2011; Riniasih, Hapsari, and Nuur 2023; Aulia et al. 2020)

One way to reduce the prevalence of blood pressure in people with hypertension is to use Moringa leaves, which are a plant rich in benefits and are usually used as vegetables. A study showed that 100 grams of dried moringa leaves contained 2,003.0 mg of calcium and 1,324 mg of calium. Previous research states that flavonoids can reduce blood pressure in people with hypertension. (Dariyanti et al., 2021; Nst et al. 2023)

Calcium is one of the most abundant minerals found in the body, having an important role in various metabolic systems of the body, including bone formation, muscle contraction, enzyme metabolism, and hormones (Adyani, 2020). Lack of calcium intake can cause hypertension by triggering the release of renin and/or parathyroid hormone which leads to vasoconstriction caused by increased intracellular calcium concentration of smooth muscle cells (Meldawati, 2020; Nst et al. 2023)

The human body cannot produce calcium. Therefore, its fulfillment is done by external fulfillment from food or supplementation (Nuryawati, 2020). Fulfillment of calcium needs in the body can be met with food consumption, one of which we can find in moringa leaves. In 100 grams of dried moringa leaves, it contains 2,003.0 mg of calcium and the calcium content in moringa leaves is 17 times more than a glass of milk. Recent pharmacological research seems to validate the claimed medicinal uses of moringa leaves can be utilized for pain relief, antioxidant, antihypertensive, anticarcinogenic, anti-diabetic, hepatoprotective, anti-microbial, antibiotic, antibacterial, detoxifying, and anti-inflammatory activities that are beneficial for treating high blood pressure. (Aekthammarat, 2020; Rahim et al., 2020; Anis Styowati, Sri Sumarni 2023)

An analysis of studies related to the effect of *Moringa oleifera* administration on blood pressure in hypertensive patients is necessary given the importance of this field of study. This study seeks to investigate this through bibliometric analysis techniques. The statistical examination of books, journals or other publications is known as bibliometrics. The analysis is used to monitor the productivity and influence of an author or researcher is used to determine the impact factor of a journal as well. Bibliometric data can also be used to look at publication linkages. In this study we concentrated on the following research questions: 1) How is the development of research on the relationship between *Moringa oleifera* and hypertension in 2020-2024. 2) authors with the most research citations related to *Moringa oleifera* and hypertension in 2020-2024, and 3) authors who contributed to *Moringa oleifera* and hypertension research in 2020-2024.

METHOD

This type of research is qualitative research with a bibliometric analysis method using vosviewers software. This research uses the google scholar database (https://scholar.google.com/) with articles distributed from 2020 to 2024. This research menace on research (Donthu et al., 2021).

2.1. Inclusion and Exclusion Criteria

This study determines the inclusion and exclusion criteria on the google schoolar search database to determine the documents to be analyzed:

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Articles relevant to the keywords "blood pressure" and "hypertension" and "*Moringa oleifera*" in the title, keywords and abstract	Articles not relevant to the keywords "blood pressure" and "hypertension" and "*Moringa oleifera*" in the title, keywords and abstract
Publications from 2020-2024	Publications under 2020
English language journal	Journal outside English
All open access	No

2.2. Research Procedure

The initial search results obtained 1002 articles, then relevant articles based on inclusion and exclusion criteria. The following is the article screening procedure which Figure 1**.**

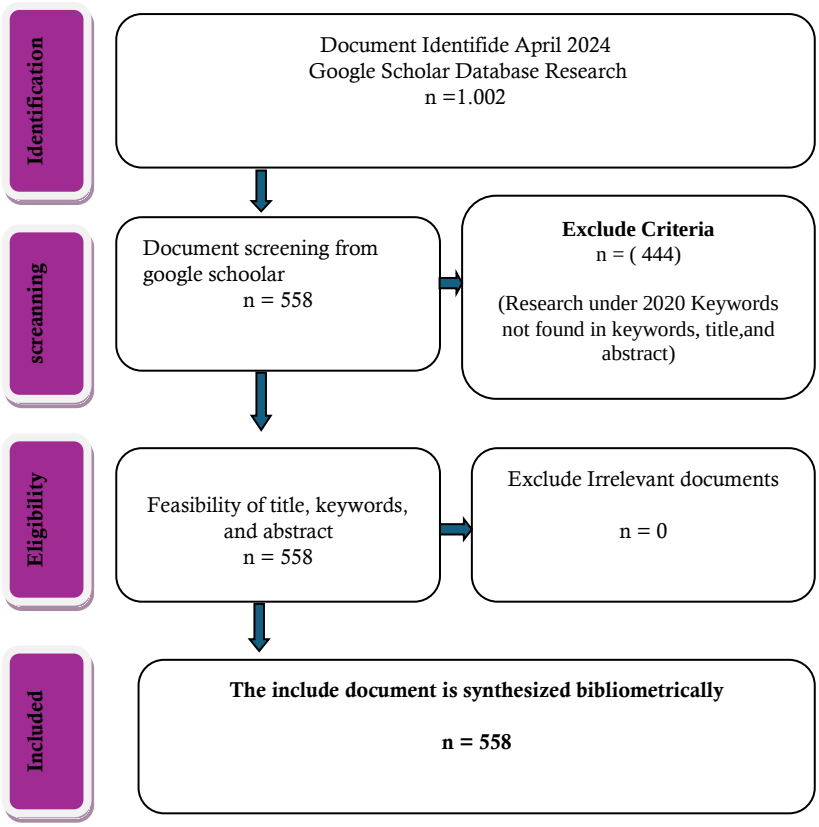

Figure 1. Procedures Research PRISMA (Donthu et al., 2021).

Based on the search results in the google schoolar database, 558 articles were identified which were then analyzed using bibliometric analysis. The Research Question in this study is as follows:

1. Frequency distribution of research on the relationship of moringa oliefera to hypertension in the last 5 years?
2. Who are the authors with the most citations in research on the relationship of moringa oliefera to hypertension in the last 5 years?
3. Which publishing institution is the destination for researchers on the relationship between *Moringa oleifera* and Hypertension from 2020-2024 to be published

RESULTS AND DISCUSSION

3.1. RQ1: Frequency Distribution of Research on the Relationship between Moringa Oliefera and Hypertension 2020-2024

Based on the search results in the Google Schoolar database, 558 articles were found that met the inclusion and exclusion criteria. The publication frequency peaked in 2023 with 143 studies. *Moringa oleifera*, better known as Moringa leaves, has been the focus of research in the context of hypertension management. In the past five years, research on the relationship between *Moringa oleifera* and hypertension has undergone significant development, as indicated by the number of articles identified through Google Scholar searches.

However, interestingly, the research orientation has grown dramatically from 2020 with 75 articles, then increased in 2021 to 93 articles, then increased again in 2022 to 115 articles and peaked in 2023 with 143 articles, in 2024 there are 131 articles which does not rule out the possibility of this research developing until the end of 2024. Based on all the keyword search results for "Blood Pressure" and "Hypertension" and "*Moringa oleifera*" (Figure 2).

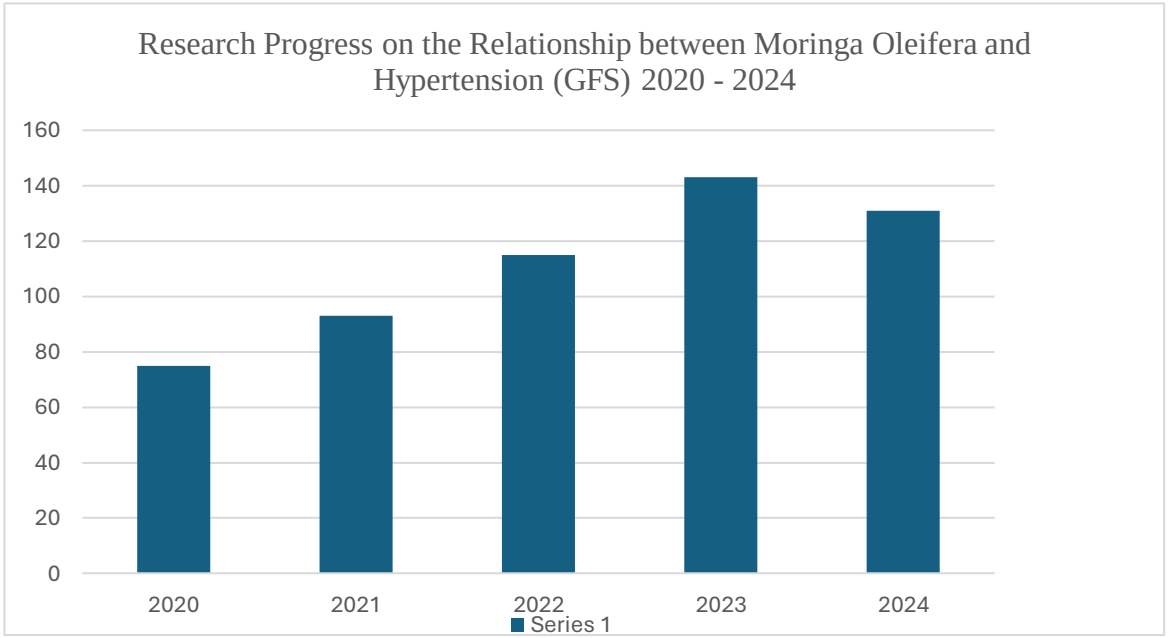

Figure 2. Distribution GFS 2020-2024

Research on the effect of moringa leaves on blood pressure in people with hypertension has increased from 2020 to 2023. The most publications were identified in 2023 with the number of publications around 143 documents with a percentage of 25.63%. Meanwhile, the results of analysis with VosViewers based on titles, keywords and abstracts can be (seen in **Figure 3**).

Hypertension, or high blood pressure, is a medical condition characterized by high persistent blood pressure in the arteries. It is a global health problem that affects millions of people worldwide and is a major risk factor for cardiovascular disease, including heart attack and stroke. Despite advances in diagnosis and treatment, the prevalence of hypertension continues to rise, especially in developing countries. Hypertension occurs when systolic blood pressure levels ≥140 mmHg or diasystolic blood pressure ≥90mmHg with repeated examinations (Lara C. Kovell et al., 2015). This condition because it is chronic usually appears together with other metabolic syndrome

diseases. It is possible that hypertension occurs due to various risk factors which are generally the cause of metabolic syndrome problems (WHO, 2021).

Hypertension has symptoms that vary in each individual and are almost the same as the symptoms of other diseases such as headaches, heart palpitations, easy fatigue, blurred vision and the world feels spinning (Soares et al., 2021)

Hypertension has two types of risk factors, namely, risk factors that cannot be changed such as genetics, gender, age, and risk factors that can still be controlled such as lack of physical activity or exercise, obesity, smoking, alcohol consumption, and excessive salt consumption. Uncontrollable risk factors are risks that arise due to internal conditions of individuals with hypertension. Based on several studies, it shows that genetic factors, gender, and age are closely related to the emergence of hypertension problems (Arum, 2019; Dismiantoni et al., 2020; Kusumawaty et al., 2016).

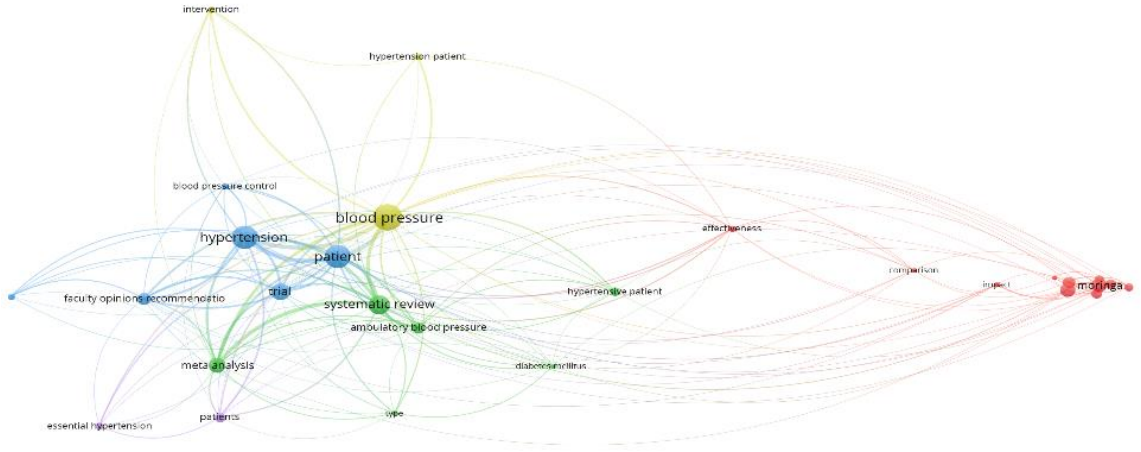

Figure 3.Visualization of Blood Preasure based on abstract and title

Based on unci words, titles and abstracts that have been analyzed using vosviewers, 558 articles with a publication ratio about blood preasure can be seen in the visualization of yellow Figure 3.

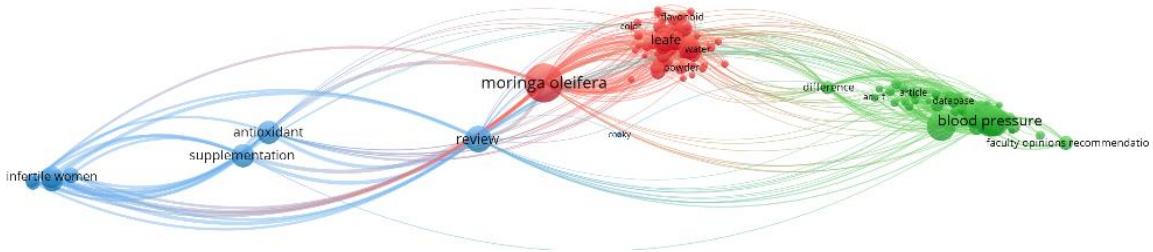

Figure 4. Visualization of Keywords Blood Pressure, Hypertension and *Moringa oleifera*

The findings from examining 558 articles containing references to the effect of *Moringa oleifera* on blood pressure in their titles, abstracts and keywords show that there are three main areas of focus within this field of study. These include *Moringa oleifera* (specifically, red), which is trending and receiving special attention from researchers and practitioners, blood pressure (green), which determines whether a person can be said to be hypertensive if their blood pressure levels are what. As well as hypertension (Blue color) which will be studied whether hypertension can be prevented or treated with *Moringa oleifera*.

Moringa leaves have a high calium content, which is 259 mg of calium / 100 g of moringa leaves, while the relatively low sodium content of moringa leaves is beneficial and safe for people with hypertension (Kintoko, 2018).

Moringa leaves contain calium , which plays a role in maintaining blood pressure to remain in a stable condition. In addition, there is potassium in moringa leaves that has the function of lowering blood pressure. The abundant potassium content in moringa can help control sodium levels in the blood, which contributes to lowering high blood pressure. Moringa leaves contain calcium and magnesium, two important minerals needed to reduce hypertension. Calcium plays a role in relaxing smooth muscles and contractions, and increasing calcium consumption can have a positive effect on blood vessels. Calcium can also regulate parathyroid hormone and act as a natriuretic substance, while magnesium regulates the activity of the sodium-calium pump/ATPase to help keep blood pressure normal. The phytospherol content in Moringa leaves can also replace the role of bad cholesterol in the blood.

Moringa leaves contain a variety of amino acids, including amino acids in the form of aspartic acid, glutamic acid, alanine, valine, leucine, isoleucine, histidine, lysine, arginine, venylalanine, tryptophan, cysteine and methionine (Yameogo et al. 2011) Arginine is an amino acid found in Moringa plants and is known to balance blood pressure. Calcium, Magnesium, calium, Zinc, and Vitamin E are also found in Moringa leaves. Moringa leaves contain all the nutrients needed to balance blood pressure. Calcium is needed for smooth muscle relaxation and contraction, increased calcium consumption can have a direct effect on blood vessels (Shah et al, 2015).

The main objective of this study was to evaluate the effect of Moringa (*Moringa oleifera*) leaf extract consumption on blood pressure reduction in patients suffering from hypertension. This study aims to determine whether moringa leaf extract can be an effective method in lowering blood pressure in hypertensive patients, as well as to explore the mechanisms that may be involved in the blood pressure reduction induced by moringa leaves.

3.2.RQ2: Authors With the Most Citations Related to the Relationship of *Moringa oleifera* to Hypertension in 2020-2024

The first author in (Lili Yang et al., 2020) with 128 citations then followed by (Erkan Kalafat at al., 2020) with 57 citations. The following are the results of related analysis of authors with the most citations during the last 5 years in research on the relationship between moringa oliefera and the incidence of hypertension (Table 2).

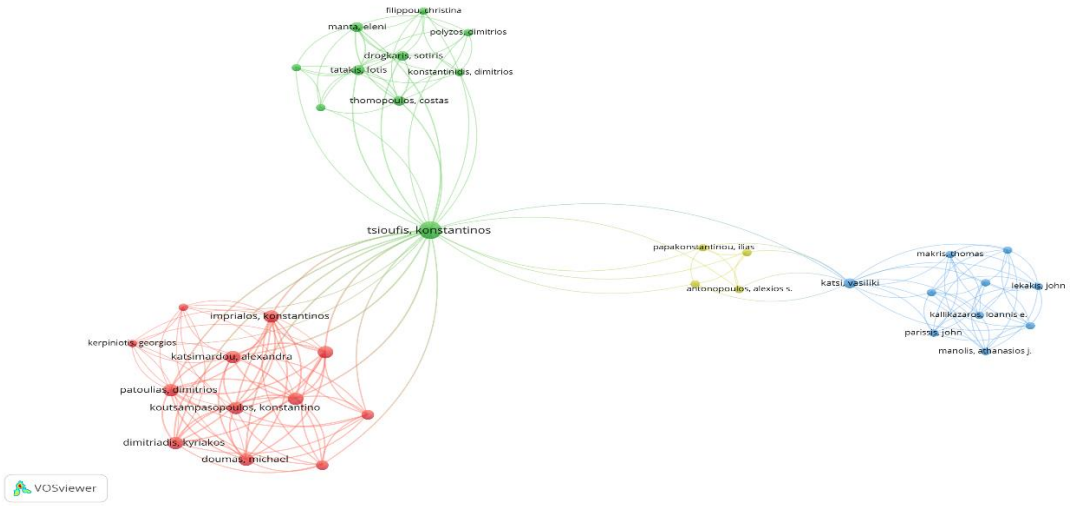

Figure 5. visualisazition co- authors

Table 2. Top 10 authors with the most citations to research on the relationship of moringan oleifara to hypertension

Authors	Title	Cited by	Journal/Publisher
(Lili Yang et al., 2020)	Elevated Blood Pressure In Childhood Or Adolescence And Cardiovascular Outcomes In Adulthood	128	Ovid Technologies (Wolters Kluwer Health)
(Erkan Kalafat et al., 2020)	Home Blood Pressure Monitoring In The Antenatal And Postpartum Period: A Systematic Review Meta-Analysis	57	Elsevier BV
(Erwy A. Ashour et al,. 2020)	Effect Of Dietary Supplementation With Moringa Oleifer Leaves And Seeds Powder On Production, Egg Characteristics, Hatchability And Blood Chemistry Of Laying Japanese Quail	40	MDPI AG
(Luna Pollini et al., 2020)	Impact Of Ultrasound Extraction Parameters On The Antioxidant Of *Moringa oleifera*	28	MDPI AG
(Mohsen Kazeminia et al., 2020)	The Effect Of Exercise On The Older Adult's Blood Pressure Suffering Hypertension; Systematic Review Meta-Analysis On Clinical Trial Studies	27	Hindawi limited
(Nanati legese, and Yohannes Tadiwos 2020)	Epidemiology Of Hypetension In Ethiopia;A Systematic Review	25	Infoma UK Limited
Sara Tasnim et al., 2020)	Effect Of Alcohol On Blood Pressure	21	Wiley
(Lanfranco D'Elia et al., 2020)	Effect Of Dietary Salt Restriction On Central Blood Pressure; Asystematic Review And Meta-Analysis Of The Intervention Studies	20	Wiley
(Direk Aekthammarat et al., 2020)	*Moringa oleifera* Leaft Extract Enhances Endothelial Nitric Oxide Production Leading To Relaxation Of Resistance Artery And Lowering Of Arterial Blood Pressure	19	Elsevier BV
(Akinleye Stephen Akinrinde et al., 2020)	Nephroprotective Effect Of Methanol Extract Of *Moringa oleifera* Leaves On Cute Kidney Injury Induced By Ischemia Reperfusion In Rats	14	African journals online (AJOL)

Moringa oleifera is a plant that has long been used in traditional medicine in various parts of the world for its diverse properties. Several studies have shown the potential of *Moringa oleifera* in reducing blood pressure and managing hypertension. *Moringa oleifera* is a plant that is rich in various essential nutrients. Here are some of the ingredients commonly found in *Moringa oleifera*: 1) Proteins: *Moringa oleifera* contains a large amount of protein, including all the essential amino acids required by the body. 2) Vitamins: *Moringa oleifera* contains various types of vitamins, including vitamin A, B vitamins (such as B1, B2, B3, B5, B6, B7, and B9), vitamin C, vitamin D, vitamin E, and vitamin K. 3) Minerals: The plant also contains essential minerals such as calcium, iron, magnesium, phosphorus, potassium, sodium, zinc, copper, and selenium.

4) Antioxidants: *Moringa oleifera* contains antioxidants such as flavonoids, beta-carotene, quercetin, and chlorophyll. Antioxidants help protect the body's cells from free radical damage. 5) Fatty Acids: *Moringa oleifera* contains essential fatty acids such as omega-3 and omega-6 fatty acids. 6) Fiber: The plant also contains dietary fiber, Ih is important for healthy digestion and blood sugar control. 7) Other Bioactive Substances: *Moringa oleifera* also contains various other bioactive substances such as isothiocyanates, phenols, and other compounds that can provide health benefits.

3.3RQ3: Publication Institution of Research on the Relationship of *Moringa oleifera* to Hypertension

The publication institutions of research on the relationship between moringa oliefera and the incidence of hypertension that appear at least 10 times are the publication targets, namely as follows:

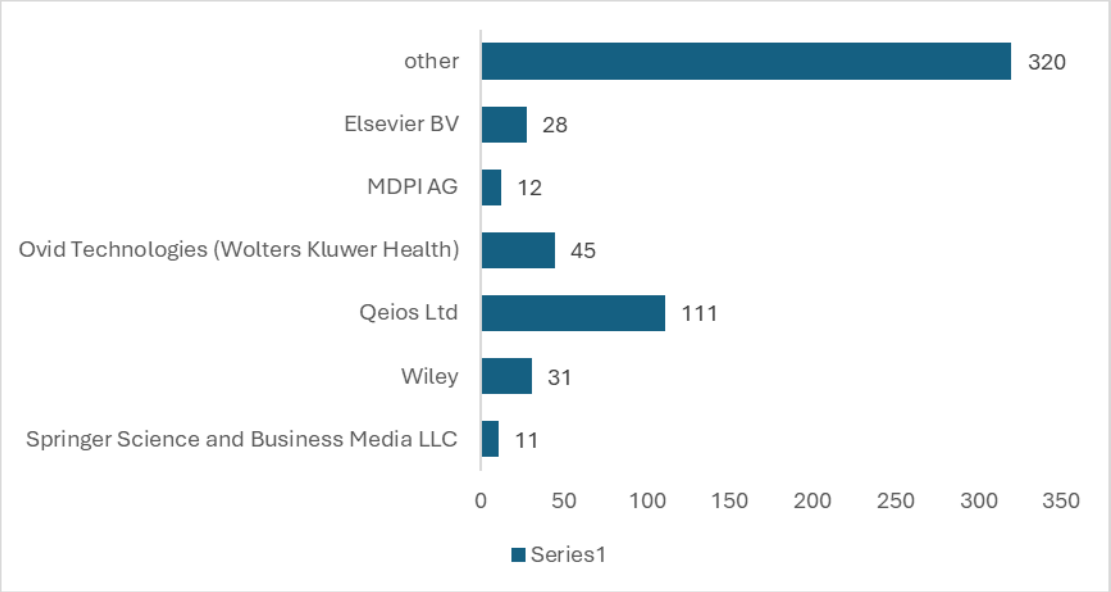

Figure 6. Research publication institutions on the relationship of *Moringa oleifera* to hypertension

Research on the relationship of *Moringa oleifera* to hypertension is mostly published in reputable international journals around 42.6%. While other researchers published their articles outside of reputable international journals as many as 320 with a percentage of 57.3%.

CONCLUSION

This study provides valuable insight into the development of research on the effect of *Moringa oleifera* on blood pressure in hypertensive patients during the period 2020-2024. *Moringa oleifera* is a non-pharmacological therapy option that can balance blood pressure because it contains calium, potassium, calcium, magnesium and various amino acids.

Through bibliometric analysis, it was found that the number of articles published in this context fluctuates, with the highest peak occurring in 2023. These findings reflect the growing interest in understanding the potential of *Moringa oleifera* as a possible therapy for the management of hypertension. In addition, the identification of the authors with the most citations, particularly Lili Yang (2020), highlights the contribution of individuals in advancing knowledge on the relationship between *Moringa oleifera* and hypertension. Nonetheless, this study also highlights the need to improve the validity and reliability of the findings by using more accurate data sources such as Scopus, Web of Science, and Taylor & Francis.

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BIOGRAPHIES OF AUTHORS

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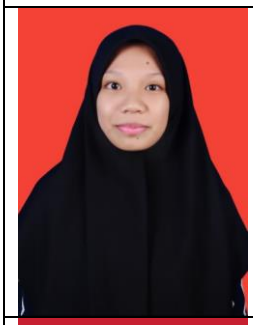	**Salsabiila** is a student of the nutrition study program at Muhammadiyah Bima University. The author was born in the city of Bima on July 12, 2004. The author is the first of 4 children of Mr. Fatayan and Juraidah. The author has taken elementary education at SDN 25 Kota Bima, then continued to the secondary level at MTsN 1 Kota Bima, and completed upper secondary education at MAN 2 Kota Bima. And currently the author is pursuing higher education at Muhammadiyah Bima University. Besides focusing on academics, the author is also active in student organizations, namely the Muhammadiyah Student Association (IMM) in the 2023-2024 period.
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