Unveiling the Scholarly Output on Hypertension in Saudi Arabia: A Bibliometric and Systematic Appraisal

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Abstract

Hypertension is a major risk factor for cardiovascular disease and stroke. This study investigates the impact of research on hypertension-related scientific output in Saudi Arabia between 2011 and 2021. The data was retrieved via the Lens database and Microsoft Office Excel 2019. The study found extensive yearly growth in publications, with "King Saud University" publishing the most documents. The United States had the highest collaboration with Saudi Arabia, followed by Egypt and India. The study concludes that Saudi Arabia has a remarkable position in hypertension research with international collaborations, with Egypt being the second most collaborative country. The country needs effective attention in conducting and promoting research activities in hypertension..

Keywords
State Central Library; Connemara Library; Sources of Information; Satisfaction

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Introduction

Hypertension, a chronic medical condition impacting millions worldwide. It serves as a significant risk factor for heart disease, strokes, kidney failure, and assorted serious health conditions. Multiple factors contribute to the onset of hypertension, including genetic predisposition, lifestyle adjustments, and underlying medical conditions. According to the World Health Organization (WHO)(2), hypertension affects a staggering one billion-plus individuals globally, establishing itself as a leading cause of premature mortality and disability worldwide(3). In the United States, nearly half of all adults contend with this malady, with a higher prevalence among older demographics and individuals grappling with concurrent chronic health conditions.

Hypertension management is paramount in averting complications and enhancing overall health outcomes(4). Lifestyle modifications, encompassing regular physical activity, adherence to a nutritious diet, and stress management, constitute integral components of hypertension management. Furthermore, pharmaceutical interventions, such as beta-blockers and calcium channel blockers, frequently emerge as prescribed modalities to regulate blood pressure.Numerous studies and clinical trials have evaluated the effectiveness of different hypertension treatments and management strategies. Overall, hypertension is a significant public health concern with a considerable impact on global health. Effective management and treatment strategies can help to prevent complications and improve overall health outcomes for individuals with hypertension(5–7). This study is to bring attention to the professional research impact of hypertension in the Kingdom of Saudi Arabia. According to the Global Burden of Disease 2010 (GBD 2010) report, high blood pressure is the main cause of mortality in the Kingdom of Saudi Arabia (KSA)(8).

Review of Literature

(9) found that his research on cuffless blood pressure measurement technology will continue to focus on portability and downsizing while enhancing monitoring accuracy to meet international medical blood pressure standards. To direct the practical uses of cuffless blood pressure monitoring technology, two important research directions will be the application of flexible electronics and machine learning approaches in the field.

(4) his bibliometric analysis of the hypertension studies, including evaluation of the contributions from key countries, particularly those in the European Union, was made possible through the combined use of PubMed and Web of Science. Through this study, we also confirmed our technique, which we can now use to assess research policy and encourage global collaboration. (10) Stated that his research into hypertension and obstructive sleep apnea is moving quickly. The United States was the highest number of research production, and Harvard Medical School was the most productive institution in this field. The main research hotspots for hypertension associated with obstructive sleep apnea were continuous positive airway pressure, cardiovascular disease, and obesity.

(6) focuses his study on virtual generation, which emerged as a trend in treatments intended to improve high blood pressure and diabetes-related fitness actions; traditional intervention patterns have been more heavily used to promote adherence to antihypertensive and anti-diabetic treatment. (11) his research title "Analysis of Argentine scientific production in MEDLINE in the area of hypertension" In the area of blood pressure and hypertension, Argentine scientific output in MEDLINE demonstrated consistent development. The overwhelming bulk is original research, which is led by scientists who are connected to public institutions. The majority of access to foreign journals is of good quality.

Materials and Methods

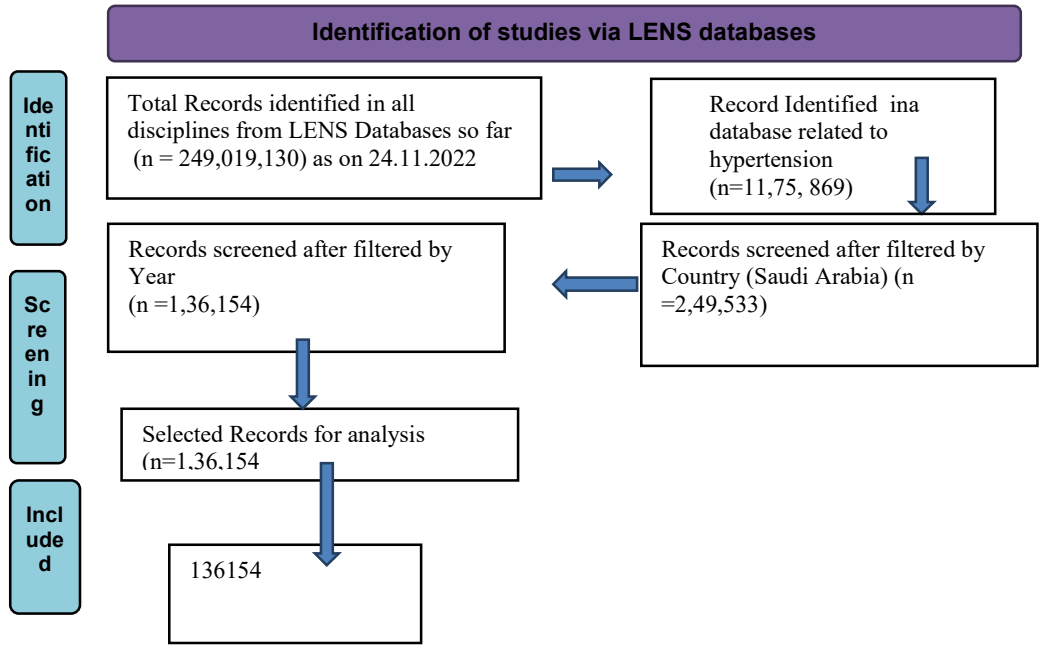
The researchers used a bibliometric and content analysis approach to carry out the research objectives. A quantitative analytical method known as "bibliometric analysis" has grown in popularity and is based on the similarity of articles in a bibliographic database. Bibliometrics analyzes the major impact of scientific knowledge, articles, researcher, or institution on the advancement at a single point in time or over a period of time[11]. Bibliometric analysis is a useful tool for determining the current state of research impact in subject areas and allowing researchers to identify and pursue new lines of research [12]. This bibliometric study focuses on published manuscripts related to hypertension by extracting data from the "LENS Database". The LENS Database is one of the indexing and abstracting databases like Scopus and Web of Science. As of November 2022, it is indexed more than 249 million data including articles, dissertations, Conference Proceedings, Book chapters, etc.

Search Strategies

This investigation was conducted in November 2022. The search involved retrieving preliminary qualitative subject headings from the "MESH database.", These terms were used to search via "LENS database" for the current research. The result was filtered by year of publication (from 2011 to 2022), and further filtered by country (Saudi Arabia, (SA). The following strategies were applied in running the query.

"Title: Hypertension OR ("Blood Pressure" OR ("Antihypertensive Agents" OR ("Vascular Resistance" OR ("Arterial Pressure" OR ("Pulmonary Wedge Pressure" OR ("Venous Pressure" OR (Prehypertension OR ("High Blood Pressure" OR ("Diastolic Pressure" OR ("Pulse Pressure" OR ("Systolic Pressure" OR ("Essential Hypertension" OR ("Malignant Hypertension" OR ("Pregnancy-Induced Hypertension" OR ("Pulmonary Hypertension" OR ("Renal Hypertension" OR ("Renovascular Hypertension" OR ("Hypertensive Retinopathy" OR ("Retinal Arterial Macroaneurysm" OR ("Masked Hypertension" OR ("White Coat Hypertension" AND Institution Country/Region: SA) "

PRISMA diagram flow chart



In the final execution of the query, 1,36,154 scientific publications were yielded. The researchers gathered the bibliographic records from The "LENS Database". All the tables and diagrams ate prepared using the LENS database, and some of the tables used Microsoft Excel.

Table 1. Documents scatter in hypertension

Document Type	Total	Percentage
Journal Article	122449	89.93
Book Chapter	3869	2.84
Conference Proceedings Article	2851	2.09
Preprint	728	0.53
Book	660	0.48
Conference Proceedings	611	0.45
Report	77	0.06
Editorial	12	0.01
Journal Issue	7	0.01
Review	6	0.00
Dataset	4	0.00
Dissertation	4	0.00
clinical Trial	2	0.00
Reference Entry	2	0.00
Letter	1	0.00
(Blank)	4871	3.58
Grand Total	136154	100.00

Table 1 summarises the distribution of different types of documents based on the total number of documents, which is 136,154. The list shows the different types of documents, frequency, and percentage. Journal articles are the predominant type of document with a total of 122,449 articles, accounting for 89.93% of all documents, followed by book chapters with 3,869 documents, representing 2.84% of all output, conference proceedings with 2,851 articles, accounting for 2.09%, and other types of documents included in the list are preprints, books, conference proceedings, reports, editorials, journal issues, reviews, datasets, dissertations, clinical trials, reference entries, and letters. Each type accounts for less than 1% of the total number of documents. The list also included an unknown category with a total of 4,871 documents, representing 3.58% of the total. This category likely refers to documents that were not mentioned in the document type. Overall, this list provides an overview of the distribution of different types of documents in a specific dataset or collection.

Table 2. Year-wise Publication Trends

Year	Doc	Percent
2011	3906	2.87
2012	5490	4.03
2013	6803	5.00
2014	9007	6.62
2015	10090	7.41
2016	11217	8.24
2017	11423	8.39
2018	13221	9.71
2019	15879	11.66
2020	22443	16.48
2021	26675	19.59
Total	136154	100.00

Table 2 represents the number of documents produced year-wise and the percentage of the total number of documents (136154) published in that year. The growth of publications has consistently increased over the years. The percentage of documents published in 2021 is the highest at 26675 viz 19.59%. In 2020, the number of documents produced was 22443, making up 16.48% of the total documents published, slightly lower than in 2021. The rest of the years revealed 2019 (15879) 11.66%, 2018 (13221) 9.71%, 2017 (11423) 8.39%, 2016 (11217) 8.24%, 2015 (10090) 7.41%, 2014 (9007) 6.62%, 2013 (6803) 5%, 2012 (5490) 4.03% and 2011(3906) 2.87%.

Table 3. Top affiliations in hypertension research, KSA

Affiliations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total
"King Saud University"	1489	1841	1848	2335	2652	3090	2828	2888	3342	5161	5547	33021
"King Abdulaziz University"	670	1306	1832	2671	2749	2699	2736	2782	3218	3841	4377	28881
"King Abdullah University of Science and Technology"	368	586	780	1101	1250	1399	1464	1592	1820	2058	2153	14571
"King Fahd University of Petroleum and Minerals"	370	403	493	587	680	673	686	887	895	1140	1143	7957
"King Khalid University"	142	225	252	242	262	316	342	639	977	1431	2249	7077
"Imam Abdulrahman Bin Faisal University"	56	92	128	165	209	333	402	596	840	1186	1244	5251
"Taif University"	123	136	197	234	257	229	245	333	368	638	2354	5114
"Taibah University"	56	103	189	239	304	384	380	583	655	956	988	4837
"Umm al-Qura University"	64	105	148	226	266	306	352	399	486	945	1312	4609
"Qassim University"	135	135	161	213	204	289	268	374	543	1022	1264	4608

Table 3 provides data on the enrollment of 10 universities in Saudi Arabia from 2011 to 2021. The table further reveals a remarkable growth in publications year-wise. "King Saud University" has the highest number of research output with (n-3302, followed by "King Abdulaziz University" (n-2881), "King Abdullah University of Science and Technology"(n-14571). "King Fahd University of Petroleum and Minerals" (n-7957), and "King Khalid University"have the next highest number of research output (n-7077), "Imam Abdulrahman Bin Faisal University" (n-5251), "Taif University" (n-5114), "Taibah University" (n-4837), "Umm al-Qura University"(n-4609), and "Qassim University" (n-4608) also hold the next positions as mentioned above.

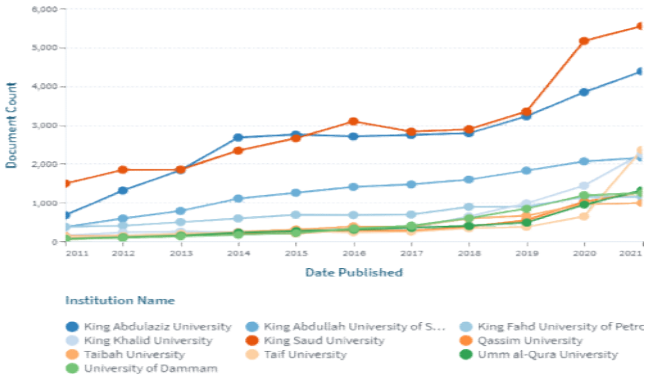


Fig.1 Top Institutions

Table. 4 Most Productive Authors

Author Display Name	Institution Name	Document Count
Abdullah M Asiri	"King Abdulaziz University"	1078
Tasawar Hayat	"King Abdulaziz University"	832
Ahmed Alsaedi	"King Abdulaziz University"	588
Seik Weng Ng	"King Abdulaziz University"	464
Mohamed-Slim Alouini	"King Abdullah University of Science and Technology"	382
Carlos M Duarte	"King Abdullah University of Science and Technology"	373
Luigi Cavallo	"King Abdullah University of Science and Technology"	326
Zeid A ALOthman	"King Saud University"	322
Udo Schwingenschlögl	"King Abdullah University of Science and Technology"	309
Mohammad Amjad Kamal	"King Abdulaziz University"	283
Xixiang Zhang	"King Abdullah University of Science and Technology"	276
Husam N Alshareef	"King Abdullah University of Science and Technology"	270
Naif Abdullah Al-Dhabi	"King Saud University"	267
Nasser M Al-Daghri	"King Saud University"	260
Mohamed Mahmoud	"King Fahd University of Petroleum and Minerals"	252

Table 4 lists the top 15 authors based on their document count. Professor Abdullah Mohammed Ahmed Asiri from "King Abdulaziz University" (KAU) has been a major contributor in this field (n-1078). Secondly Prof Tasawar Hayat of"King Abdulaziz University" (n-832) and prof Ahmed Alsaedi, Hayat of"King Abdulaziz University" (n-588) followed by Prof Seik Weng Ng, "King Abdulaziz University" (n-464), Mohamed-Slim Alouini (n- 382), Carlos M Duarte(n-372), Luigi Cavallo (n-326), Zeid A ALOthman (n-322), Udo Schwingenschlögl (n-309), Mohammad Amjad Kamal (n-283), Xixiang Zhang (n-276), Husam N Alshareef (n-260), Naif Abdullah Al-Dhabi (n-267), Nasser M Al-Daghri (n-260), Mohamed Mahmoud (n-252)

Fig.2 Most Productive Authors

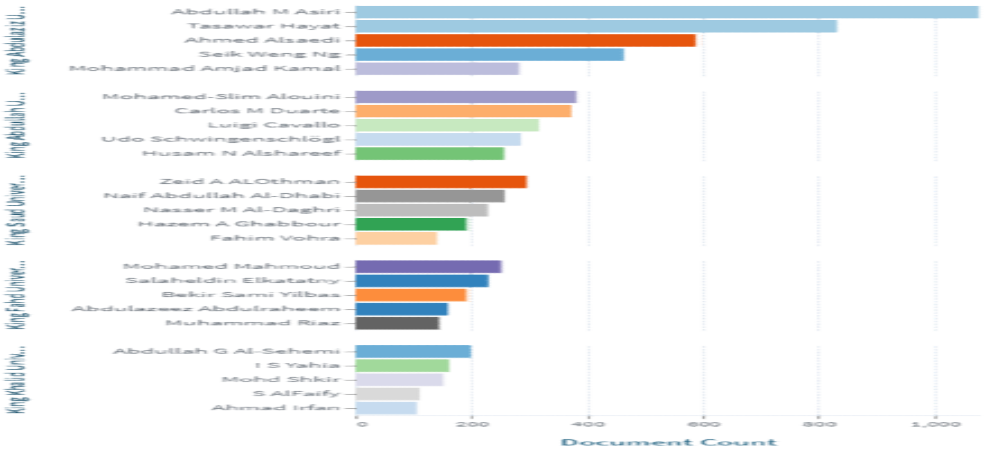


Table .5 Top sources published by Saudi Arabian affiliations

Source Title	Affiliation Name	Document Count
"Saudi Journal of Biological Sciences"	"King Saud University"	899
"Molecules (Basel, Switzerland)"	"King Saud University"	493
"Acta Crystallographica. Section E, Structure Reports Online"	"King Abdulaziz University"	443
"Scientific Reports	"King Abdullah University of Science and Technology"	375
"Plos One"	"King Saud University"	371
"Arabian Journal For Science And Engineering"	"King Fahd University of Petroleum and Minerals"	367
"Saudi Pharmaceutical Journal : SPJ : The Official Publication Of The Saudi Pharmaceutical Society"	"King Saud University"	365
"Scientific Reports	"King Saud University"	309
"Plos One"	"King Abdulaziz University"	292
"Scientific Reports	"King Abdulaziz University"	280
"Saudi Journal of Biological Sciences"	"King Abdulaziz University"	253
"Advances In Difference Equations"	"King Abdulaziz University"	210
"All Days"	"King Fahd University of Petroleum and Minerals"	191
"ACS Applied Materials & Interfaces"	"King Abdullah University of Science and Technology"	190
"Journal of the American Chemical Society"	"King Saud University"	171

The table 5 presents a scattering of publications by Saudi Arabian Affiliations in various sources. The list includes highest published Saudi Arabian affiliations in hypertension ."King Saud University", "King Abdulaziz University", "King Fahd University of Petroleum and Minerals", and "King Abdullah University of Science and Technology" are the leading Institutions in hypertension productivity.

The most frequent institution in the list are "King Saud University", with a total of (n-2608) documents published in different source titles.Viz. "Saudi Journal of Biological ScienceJournal), "Molecules (Basel, Switzerland)" (n-493), "Plos One" (n-371), "Saudi Pharmaceutical Journal : SPJ : The Official Publication Of The Saudi Pharmaceutical Society" (n-365), "Scientific Reports" (n-309) and "Journal of the American Chemical Society" (n-171). "King Abdulaziz University" is at the second position with (n-1478) documents published in the "Acta Crystallographica. Section E, Structure Reports Online" (n-443), "Plos One" (n-292), "Scientific Reports" (n-280), "Saudi Journal of Biological Sciences" (n-253) and Advances in Difference Equations (n-210). "King Abdullah University of Science and Technology" Scored the next position with (n-565) documents published in Scientific Reports (n-375) and "ACS Applied Materials & Interfaces" (n-190). "King Fahd University of Petroleum and Minerals" scored (n-558) documents distributed in "Arabian Journal for Science and Engineering" (n-367), "All Days" (n-191). "Saudi Journal of Biological Sciences" got the highest number of publications with "King Saud University". The second most frequent journal is "Molecules (Basel, Switzerland)" with a total of (n-493) documents published.

Fig .4 Top sources published by Saudi Arabian affiliations.

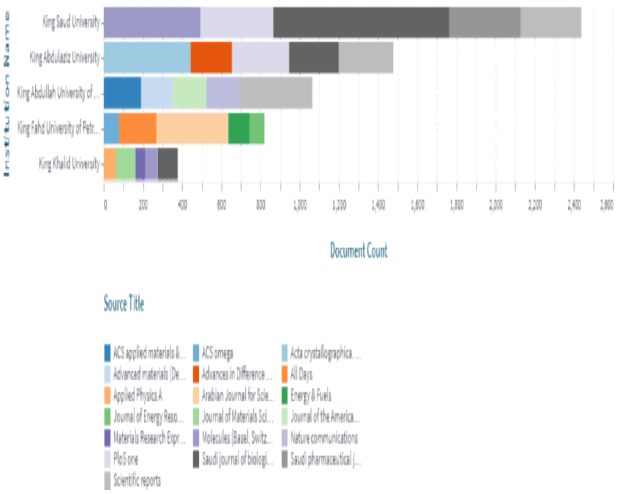
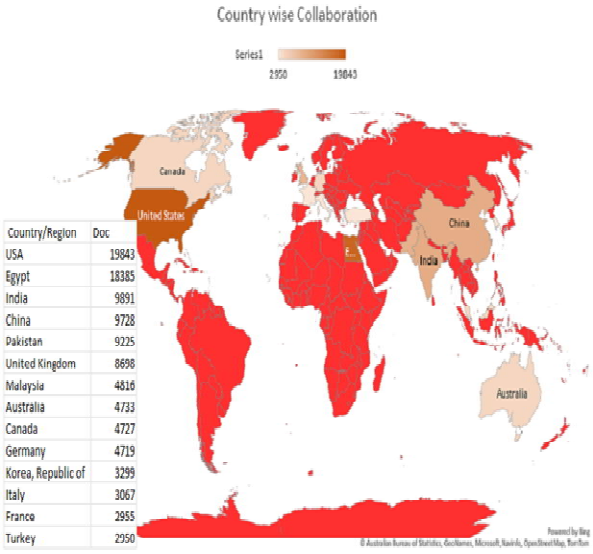


Fig. 5 Degree of collaboration



Country/Region	Doc
USA	19843
Egypt	18385
India	9891
China	9728
Pakistan	9225
United Kingdom	8698
Malaysia	4816
Australia	4733
Canada	4727
Germany	4719
Korea, Republic of	3299
Italy	3067
France	2955
Turkey	2950

The table shows the number of documents published collaborating with different countries/regions. The countries are listed in descending order based on the document count. The United States has the highest number of publications of hypertension in collaboration with Saudi Arabia (19,843), followed by Egypt with 18,385 and India with 9,891. China and Pakistan complete the top five with 9,728 and 9,225 documents respectively. The table also shows that developed countries such as the United Kingdom, Australia, Canada, Germany, Italy, and France have many publications.

Discussion:

The evaluation of the bibliometric analysis, and impact of hypertension research conducted in Saudi Arabia can be accomplished in recent years, there has been a significant increase in the quantity of hypertension research output conducted in Saudi Arabia. The percentage of published articles also indicates a clear and consistent uptrend year by year from 2011 to 2021, which grew from 2.87% to 19.59%. Number of published documents can be attributed to various factors, such as technological advancements, available funding, and the increasing demand for research in diverse fields among the universities, "King Saud University" boasts the highest number of publications, with a total of 33,021 documents published over ten years, followed by "King Abdulaziz University". "King Saud University" an held a important position as one of the oldest and largest Universities in Saudi Arabia, with huge volumes of research productivity history and a reputation as a leading institution across multiple disciplines. Similarly, "King Abdulaziz University" has made significant contributions to research in Saudi Arabia, thanks to its strong emphasis on scientific research and innovation.

Conclusions

Blood pressure (BP) research has shown that there has been a steady increase in this field over the last few decades. The research topics include hypertension, heart disease, and lifestyle changes. This study's findings could have several implications for the research community and policymakers. The study may draw attention to current research trends and gaps in hypertension research, which may aid in future studies and funding initiatives.

Furthermore, the study's results could provide bibliometic knowledge to healthcare professionals regarding the latest trends related to hypertension. The analysis of the literature on hypertension and a bibliometric evaluation can offer a comprehensive and organized perspective of the existing research outputs. This could be beneficial in making future

decisions about hypertension treatment that are based on evidence.

In general, the data shown in the table highlight the variety of research based on bibliometric analysis conducted in different universities in Saudi Arabia. The distribution of publications strength is reflects the universities unique strengths and focuses of each institution, emphasizing the importance of collaboration and partnerships in achieving research excellence. Additionally, the data underscore the need to invest in research infrastructure and resources to facilitate high-quality research and promote innovation.

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