

## A BIBLIOMETRIC STUDY: HYPERTENSION DURING PREGNANCY

### *Gebelikte Hipertansiyon: Bibliyometrik Bir Çalışma*

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#### ABSTRACT

#### ÖZ

**Objective:** Early detection of hypertension is important for maternal health. We aim to shed light on future studies by conducting a comprehensive bibliometric analysis of the literature on pregnancy hypertension.

**Material and Methods:** In this study, articles published in the Web of Science Core Collection on hypertension in pregnancy between 1975 and 2019 were evaluated. Documents produced in 2020 excluded. The words "pregnancy" and "hypertension" were used as keywords for database scanning. Gunmap web-based application used to visualize the scientific efficiency of countries. The Vosviewer (Version 1.6.14) program was also used to display bibliometric connections of data.

**Results:** Two thousand, one hundred and twenty articles on the subject were identified. It has been observed that the number of citations to articles and articles published in recent years on hypertension in pregnancy has reached a peak. The USA and the UK were identified as the countries with the most articles published and the most cited journals. China and India have also been found to be countries with increased productivity over the past decade.

**Conclusion:** With this study, we have determined the most active journals, universities and authors on the subject. We have shown that the issue of hypertension during pregnancy is a field of study in which scientific publications are increasingly published. We believe that our analyses will be a guide for future studies on hypertension during pregnancy.

**Keywords:** Pregnancy, hypertension, bibliometry

**Amaç:** Hipertansiyonun erken tespiti anne sağlığı için çok önemlidir. Amacımız gebelik hipertansiyonu ile ilgili literatürün kapsamlı bir bibliyometrik analizini yaparak gelecekteki çalışmalara ışık tutmaktır.

**Gereç ve Yöntemler:** Bu çalışmada, 1975-2019 yılları arasında Web of Science Core Collection'da gebelikte hipertansiyon üzerine yayınlanan makaleler değerlendirildi. 2020 yılında üretilen belgeler hariç tutuldu. Veritabanı taraması için anahtar kelimeler olarak "hamilelik" ve "hipertansiyon" kelimeleri kullanıldı. Gunmap web tabanlı uygulama ülkelerin bilimsel verimliliğini görselleştirmek için kullanıldı. Vosviewer (Sürüm 1.6.14) programı da verilerin bibliyometrik bağlantılarını görüntülemek için kullanılmıştır.

**Bulgular:** Konuyla ilgili 2120 makale tespit edildi. Son yıllarda gebelikte hipertansiyon ile ilgili makale ve makalelere yapılan atıf sayısının zirveye ulaştığı gözlenmiştir. ABD ve İngiltere'nin konu hakkında en çok makalenin yayınlandığı ve en çok atıf yapılan dergilerin bulunduğu ülkeler olduğu tespit edildi. Çin ve Hindistan'da ise son on yılda konu hakkında yapılan yayınlarda artış olduğu görülmüştür.

**Sonuç:** Bu çalışma ile konuyla ilgili en aktif dergileri, üniversiteleri ve yazarları belirledik. Hamilelik sırasında hipertansiyon konusunun bilimsel dergilerde giderek daha fazla yayınlandığı bir çalışma alanı olduğunu gösterdik. Analizlerimizin hamilelik sırasında hipertansiyon ile ilgili gelecekteki çalışmalar için bir rehber olacağına inanıyoruz.

**Anahtar Kelimeler:** Gebelik, hipertansiyon, bibliometri



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## INTRODUCTION

Despite extensive research, what causes pregnancy-induced hypertension remains an unsolved problem in obstetrics (1). In developed countries, the number of maternal deaths from hypertension in pregnancy has fallen steadily over the past few decades (2). However, in other parts of the world, the rates of mortality and morbidity remain high (3).

Hypertension during pregnancy can be classified in many subgroups. Among these clinical conditions that constitute the most serious life-threatening condition for pregnant women is pre-eclampsia. Pre-eclampsia incidence is 5-11% (4). Hypertension is important for both mother and baby health in pregnant women. For this reason, many documents have been published about this subject in many scientific journals. In these scientific publications, it was tried to determine the features of the disease and to guide its treatment. Although there has been a large amount of publication, no bibliometric study has been published on this subject so far.

Since Vassily V. Nalimov coined the term 'scientometrics' in the 1960s, this term has grown in popularity and is used to describe the study of science: growth, structure, interrelationships and productivity (5). Bibliometric analysis is to shed light on the subject's processes and the nature and course of discipline by counting and analyzing various aspects of documents (6).

In this study, we performed a bibliometric analysis of the documents published about hypertension in pregnancy. Thus, we aimed to evaluate the change in the number of publications and citations over the years, to identify the most active countries, authors and journals and to guide new scientific studies.

## MATERIALS AND METHODS

In our study, the Web of Science (WoS) database core collection index was used as a resource. Documents published in the database between 1975-2019 were used in our research, and the documents published in 2020 were not included in the study because the effect factors were not yet clear. While searching the database, the words 'pregnancy' and 'hypertension' were used as keywords in document titles. 2120 original articles were identified and included in the study. Gunmap free open web-based application was used to visualize global research productivity. The web-based and open access Vosviewer (Version 1.6.14) program was used to visualize the bibliometric connections of the data.

## RESULTS

*1. General Features and Global Productivity:* Three thousand, seven hundred and fifty-four documents were identified with the keywords used. Of these documents, 2120 were articles, 984 were meeting abstract, 176 were letter, 172 were proceedings paper, 154 were review, 147 were editorial material and 101 were other document types. Bibliometric analysis was performed on 2120 articles in the scanned documents. The h-index of these articles was 89, the sum of times citation was 46319, and the average number of citations per document was 21.84.

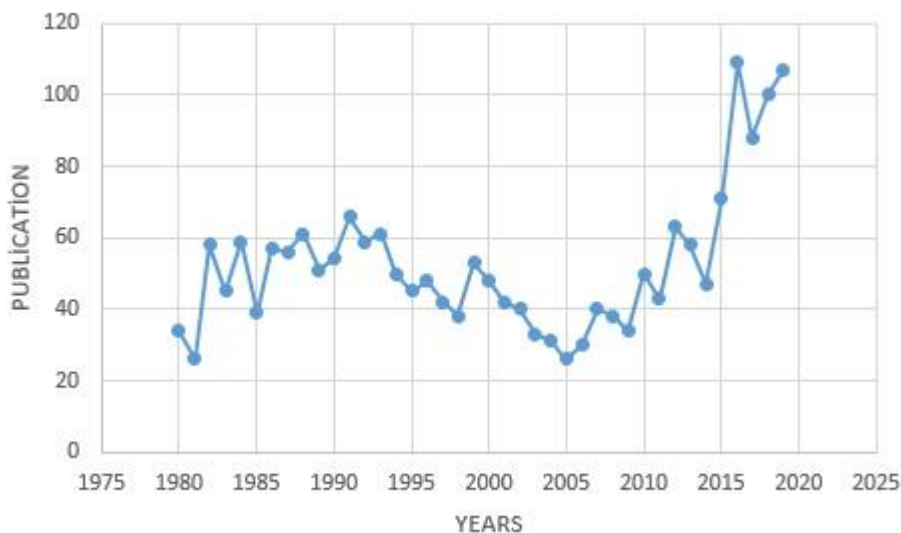
Most of the publication of hypertension in pregnancy was made in the area of obstetrics and gynaecology, then in the field of cardiology and cardiovascular diseases, and the third place, in the field of internal medicine. (Table 1).

**Table 1:** The top ten research areas of documents in “pregnancy and hypertension” according to Web of Science database

Research Areas	Number of Publication	% of 2120
Obstetrics and Gynecology	905	42.68
Cardiovascular System Cardiology	477	22.5
General Internal Medicine	300	14.15
Physiology	165	7.78
Research Experimental Medicine	102	4.81
Pharmacology Pharmacy	94	4.43
Pediatrics	92	4.34
Reproductive Biology	83	3.91
Endocrinology Metabolism	59	2.78
Public Enviromental Occupational Health	56	2.64

Although the number of articles related to hypertension in pregnancy varies by years, it has reached its highest level in recent years (Figure 1). The number of citations increased and reached its peak in 2019 (Figure 2). The published articles were analyzed in the WoS database for the productivity of the countries. We observed that the most productive country was the USA with 513 articles. It was determined that 201 articles from the UK and 132 articles from China were

published. The total of publications made by these three countries constituted 39.9% of the publications related to hypertension in pregnancy worldwide (Figure 3). Regions with the lowest efficiency in terms of publication were also evaluated. We have observed that the productivity in African, Central Asian and South American countries is low or there is no published article (Figure 4).



**Figure 1:** Graph of publications about pregnancy and hypertension by years.

Sum of Times Cited per Year

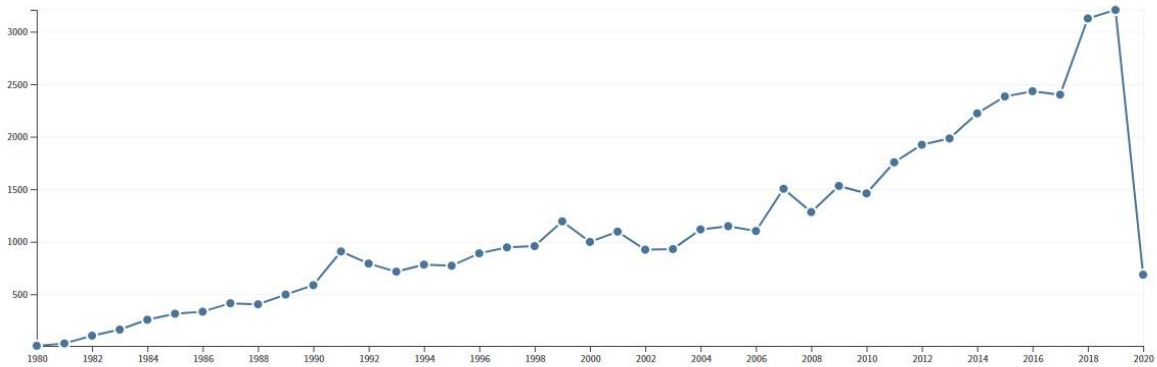


Figure 2: Graph of citations about pregnancy and hypertension by years.

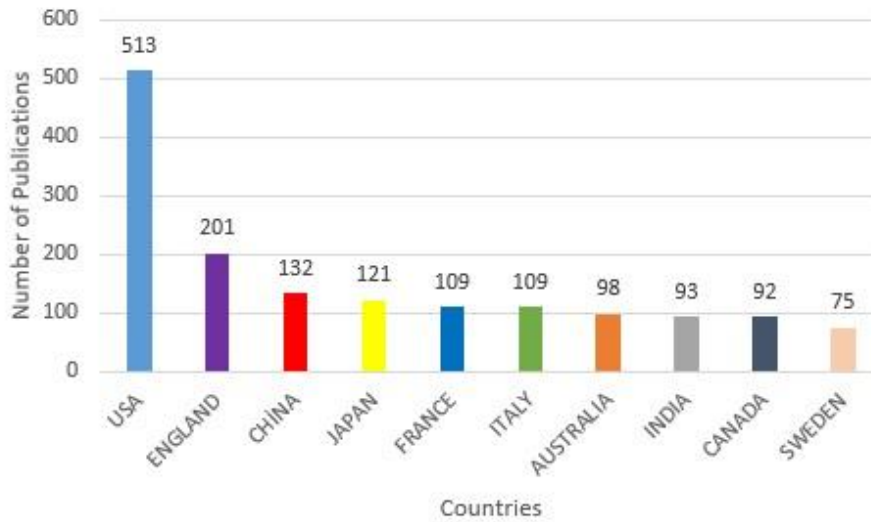


Figure 3: The top ten publishing country charts on pregnancy and hypertension.

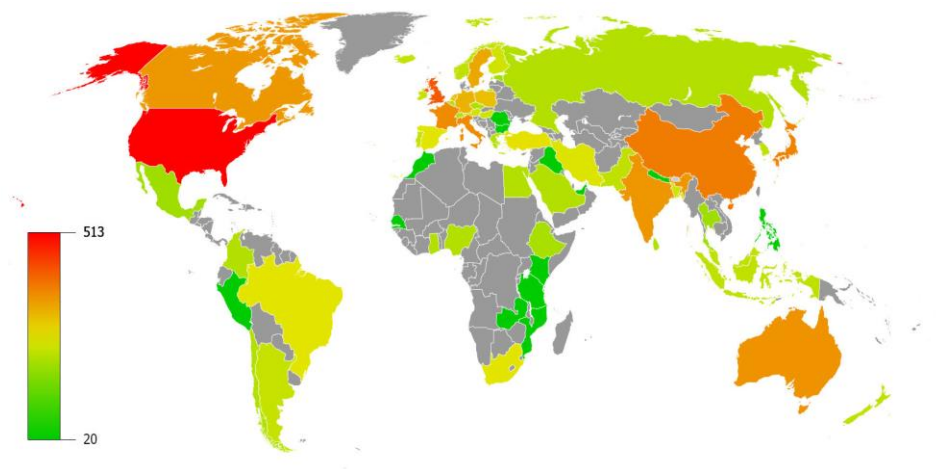


Figure 4: Global pregnancy and hypertension publication density according to the countries.

*2. Productivity of Authors and Institutions:*

The productivity of the authors was examined, the most productive author was found to be Sibai, Baha M., from the University of Texas Health Science central university in the United States. The 10 most productive authors and countries are presented in Table 2. The efficiency of the institutions was compared. The most efficient institution in terms of publications on hypertension during pregnancy has been determined as

Mississippi University. The institutions with the highest number of articles published are listed in Table 3.

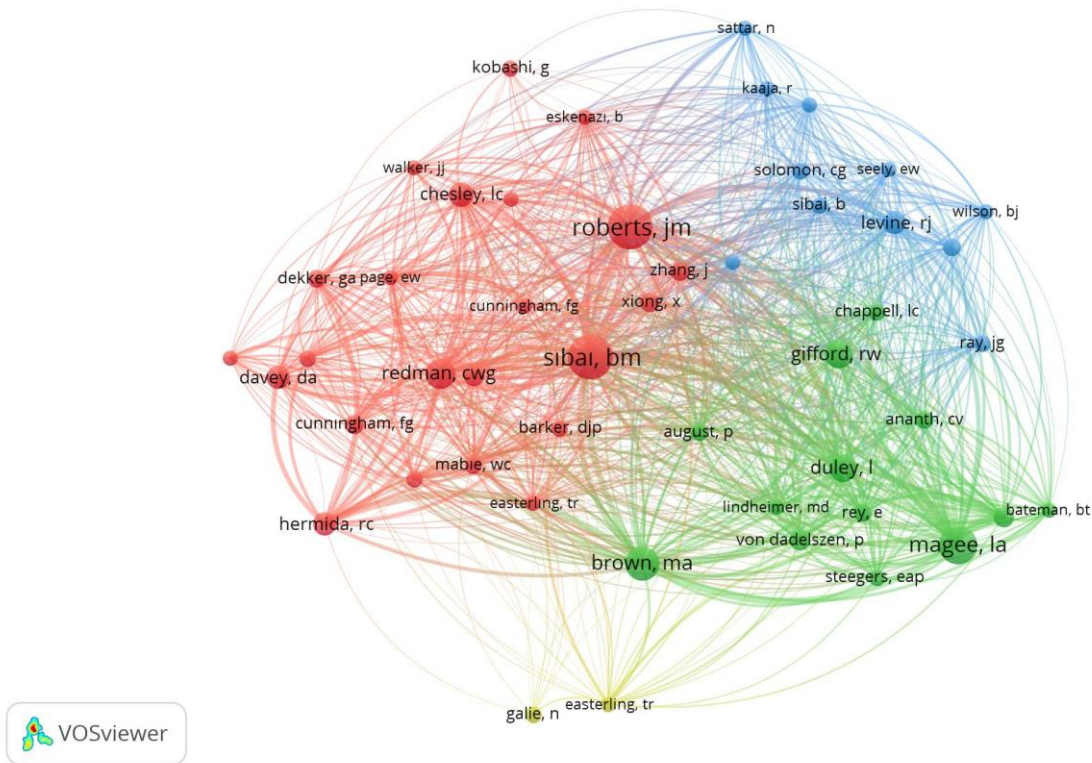
*3. Authorship and Institutions Co-citation:* Co-citation analysis has shown that 18235 authors are investigating the topic of hypertension in pregnancy. Figure 5 shows the bibliometric citation network of 24 authors receiving at least 50 citations.

**Table 2:** The first ten authors by record count in "pregnancy and hypertension " literature between 1975 and 2019

<b>Authors</b>	<b>Institution</b>	<b>Record Count</b>	<b>% of 2120</b>	<b>Total Citation</b>
Sibai BM	Un. of Texas Health Science Center Houston, USA	30	1.41	3409
Brown M	St George Hospital, Australia	22	1.03	1131
Magee L	King College London, England	22	1.03	956
Von Dadelszen P	King's College London, England	21	0.99	888
Martin JN	University of Mississippi, USA	18	0.84	478
Fieveet P	Department of Nephrology Center Hospitalier Laennec De Creil, France	17	0.80	185
Lunell NO	Karolinska Institutet Huddinge, Sweden	17	0.80	478
Foumier A	Nephrology Department CHU Amiens, France	16	0.75	190
Gallery EDM	University of Sydney at Royal North Shore Hospital, St. Leonards, Australia	16	0.75	291
Nisell Henry	Karolinska University Hospital Karolinska Inst Sweden	16	0.75	487

**Table 3:** The top ten institutions by number of publications in pregnancy and hypertension literature

<b>Research Areas</b>	<b>Number of Publication</b>	<b>% of 2120</b>
University of Mississippi	33	1.55
Tel Aviv University	31	1.46
Harvard University	29	1.36
University of Toronto	25	1.17
University of British Columbia	24	1.13
University of Glasgow	24	1.13
University of Montreal	24	1.13
University of Ottawa	22	1.03
University of Texas	22	1.03
University of Pittsburgh	20	0.94



**Figure 5:** Network visualization map of co-citation analysis of active authors.

4. *Significant Publications:* The most cited documents about hypertension in pregnancy were scanned, and it was observed that the research published by Roberts, James M. et al was the most cited. The 10 most cited publications are presented in Table 4.

5. *Productivity of Journals:* Journals were analyzed according to the number of publications on hypertension during pregnancy. We found that the “American Journal of Obstetrics and Gynaecology” is the most productive journal and 5.99% of all documents are published in this journal. The second most productive journal was “Hypertension in Pregnancy” and the third journal “Obstetrics and Gynecology”. The top three journals published 13.39% of all publications (Table 5). There were 610 journals that published about hypertension in pregnancy. Among these journals, 29 journals with at least 10 articles published and at least 50 citations were

selected. It is determined that the most-cited journal is “Obstetrics and Gynecology” (Figure 6).

6. *International Collaboration:* It was determined that different numbers of publications from 101 countries were published on hypertension during pregnancy. At least five broadcasts were found in 51 of 101 countries. Collaboration between these 51 countries is shown in Figure 7. The USA, England, Canada, China and Japan perform a central role in this collaboration.

7. *Trend Topics:* We detected that a total of 2196 repetitive words were used in the bibliometric analysis of publications related to hypertension during pregnancy. After filtering, we found that 42 words are used very often to identify words that repeat at least 10 times in a post and may be a keyword for this topic. After our analysis, we found that the keywords that intersect in all publications are “pregnancy, hypertension, pre-eclampsia,” in order of frequency. (Figure 8).



**Table 4:** The top ten most cited manuscripts about pregnancy and hypertension

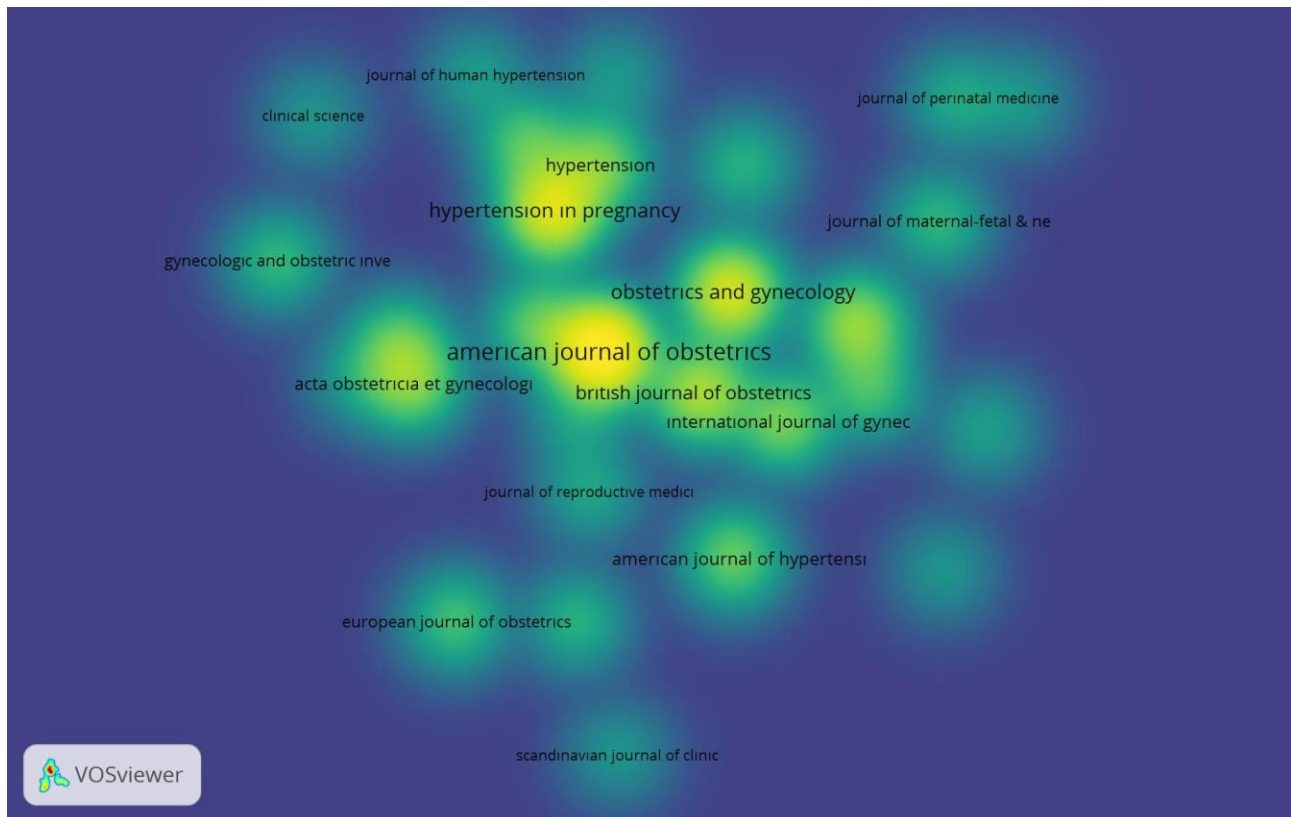
No	Article	Author	Journal Name/Published	TC	ACI
1	Hypertension in pregnancy report of the american college of obstetricians and gynecologists' task force on hypertension in pregnancy	Roberts JM, Bakris G et al.	Obstetrics and Gynecology, 2013	1812	226.5
2	Preeclampsia-more than pregnancy-induced hypertension	Roberts JM, Redman CWG	Lancet, 1993	991	35.39
3	Syndrome of hemolysis, elevated liver-enzymes, and low platelet count- a severe consequence of hypertension in pregnancy	Weinstein L	American Journal of Obstetrics and Gynecology, 1982	908	23.28
4	Summary of the nhlbi working group on research on hypertension during pregnancy	Roberts JM, Pearson G, Cutler J et al.	Hypertension, 2003	428	23.78
5	Low-dose aspirin prevents pregnancy-induced hypertension and preeclampsia in angiotensin-sensitive primigravidae	Wallenburg HCS, Makovitz JW, Dekker GA et al.	Lancet, 1986	415	11.86
6	Hypertensive diseases of pregnancy and risk of hypertension and stroke in later life: results from cohort study	Wilson BJ, Watson MS, Prescott GJ et al.	British Medical Journal , 2003	405	22.50
7	Activating mineralocorticoid receptor mutation in hypertension exacerbated by pregnancy	Geller DS, Farhi A, Pinkerton N et al.	Science, 2000	376	17.90
8	Protein intake in pregnancy, placental glucocorticoid metabolism and the programming of hypertension in the rat	LangleyEvans SC, Phillips GJ, Benediktsson R et al.	Placenta , 1996	328	13.12
9	The use of aspirin to prevent pregnancy-induced hypertension and lower the ratio of thromboxane-a2 to prostacyclin in relatively high-risk pregnancies	Schiff E, Peleg E, Goldenberg M et al.	New England Journal of Medicine, 1989	313	9.78
10	Hypertension in pregnancy- clinical-pathological correlations and remote prognosis	Fisher Ka, Luger A, Spargo BH et al.	Medicine , 1981	305	7.63

TC: Total Citation; ACI: Average Citations per Item

**Table 5:** The first fifteen journal source by number of publications and citations on pregnancy and hypertension

Journal Name	No	% of 2120	C
American Journal of Obstetrics and Gynecology	127	5.99	2388
Hypertension in Pregnancy	81	3.82	899
Obstetrics and Gynecology	76	3.58	3969
Clinical and Experimental Hypertension Part B Hypertension in Pregnancy	57	2.68	775
British Journal of Obstetrics And Gynaecology	56	2.64	885
Pregnancy Hypertension an International Journal of Womens C.vascular Health	49	2.31	337
European Journal of Obstetrics Gynecology and Reproductive Biology	45	2.12	245
Acta Obstetricia et Gynecologica Scandinavica	40	1.88	630
Hypertension	40	1.88	1607
International Journal of Gynecology Obstetrics	39	1.84	432
American Journal of Hypertension	35	1.65	908
Archives of Gynecology And Obstetrics	33	1.55	196
Journal of Hypertension	31	1.46	632
Australian New Zealand Journal of Obstetrics Gynaecology	29	1.36	289
American Journal of Perinatology	26	1.22	157

No: Number of publications; C: Citations (Without Self Citations)



**Figure 6:** Network visualization of productivity of journals.



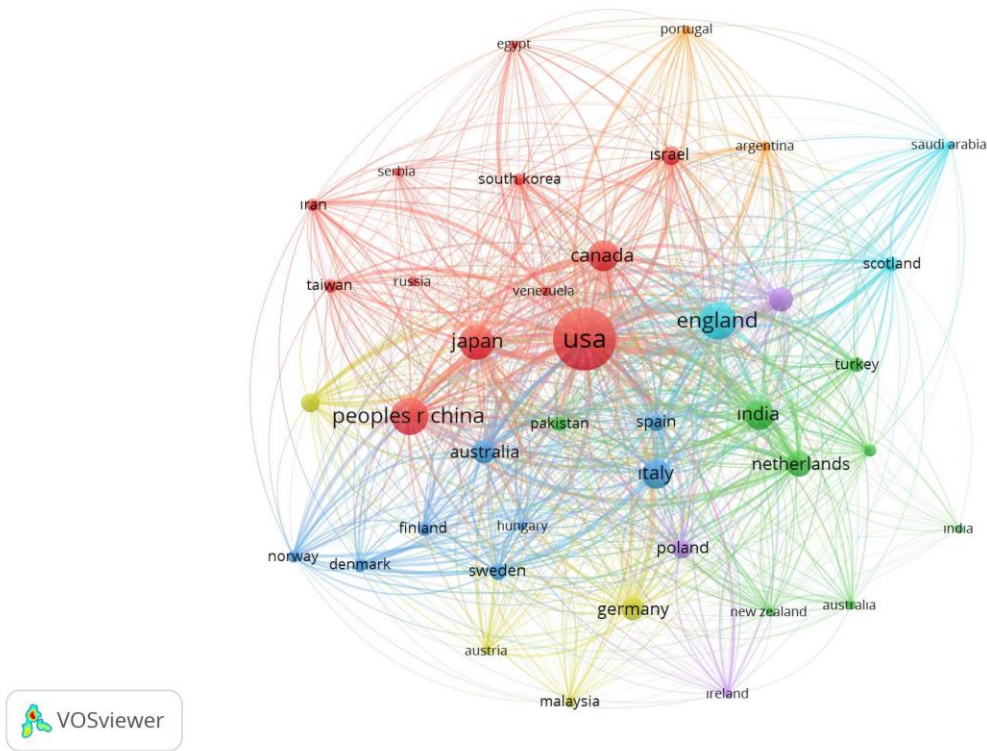


Figure 7: Network of co-contributing / collaborative countries on pregnancy and hypertension

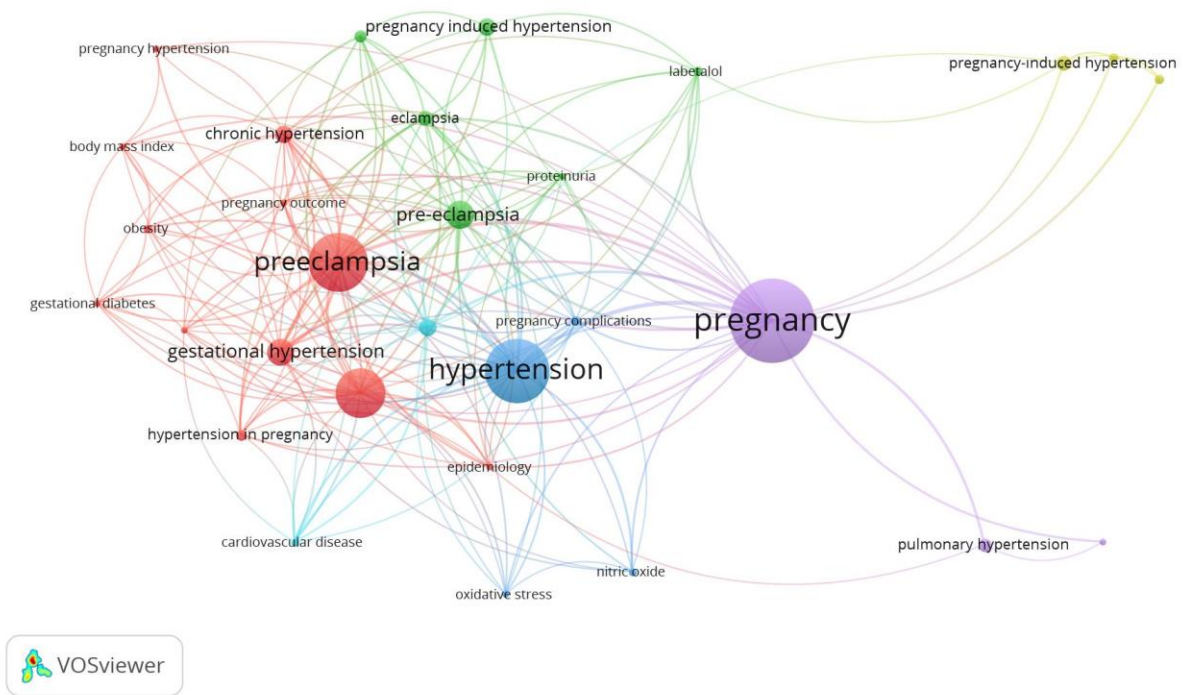


Figure 8. Network visualization map of relationships between the most commonly used trends keywords

## DISCUSSION

In this study, we aimed to show the variability of the documents published about hypertension during pregnancy over the years and the scientific areas in which the studies were conducted by bibliometric analysis. We aimed to identify the most cited articles, identify the most active journals and authors and guide future scientific studies on the subject. Although many documents have been published about hypertension during pregnancy, this article we have published in the first bibliometric study on the subject.

Hypertension is a disease that is frequently seen during pregnancy and can cause stroke and death when it is severe (7). For this reason, early diagnosis and control of hypertension are very important during pregnancy.

Pre-eclampsia, one of the hypertensive disorders seen in pregnant women, is also included in Ancient Egypt, Chinese, Indian and Greek medical literature (8). In studies performed to date, the pathological process causing hypertension in pregnancy is not fully understood. Hypertension during pregnancy can be divided into groups such as gestational hypertension, pre-eclampsia, essential hypertension, secondary hypertension and superimposed pre-eclampsia (9). The frequency of hypertension during pregnancy in nulliparous is 3-10% (10). Although there are many different causes of hypertension in pregnancy, the most clinically important condition is pre-eclampsia (11). In addition to these pathological changes, as in other cardiovascular diseases there are also extensive endothelial dysfunctions in preeclampsia (12).

Although pre-eclampsia is said to be a vascular endothelial disorder, it is a multisystem disorder with various forms (13). The superiority of the fields of cardiology and cardiovascular system is not seen in the publications on the subject although the cardiovascular system is important in explaining the pathogenesis of the disease. In our study, it has been

seen that most of the publications on the subject are in the field of obstetric and gynaecology. The comprehensive pre-pregnancy evaluation and monitoring during pregnancy are best provided by a team made up of a cardiologist, obstetrician and obstetric anesthetist (14). Similarly, in this study, it was found that gynaecologists worked with cardiologists and physiologists.

The first documents published on the subject in the database were published in the early 1980s. It is seen that the number of published documents and citations to documents has increased gradually after 2005. This shows that the interest in the subject is increasing in scientific groups.

The best indicator of the scientific performance of countries is the publications they produce (15). Therefore, the productivity of the countries was evaluated. In the analysis, it was determined that the USA and European countries are at the top in terms of productivity. The fact that the first five journals with the most documents are based in USA and Europe supports this finding. As previously, the USA is still the country that produces most of the scientific publications in all scientific fields all over the World (16). However, most of the documents from China and India have been published in the last decade. It can be said that the productivity of these two countries is increasing.

The author who published the most documents on hypertension during pregnancy is Sibai, Baha M. from the University of Texas Health Science Center Houston. It seems that the author regularly publishes on the subject over the years.

He is also among the authors of the article titled "Hypertension in Pregnancy Report of the American College of Obstetricians and Gynecologists' Task Force on Hypertension in Pregnancy". This article is the most cited document on the subject. This article has been the

most cited document in this regard with a total of 1817 citations.

It is determined that the journal with the highest number of documents is “American Journal of Obstetrics and Gynaecology”. This journal received a total of 2388 citations from documents published on the subject. It is understood that the journal with the highest number of citations is “Obstetrics and Gynaecology”. The two most cited journals on the subject are also based in the USA.

Our study has some limitations. The first is that the subject of our study is multidisciplinary and evaluations and comparisons cannot be made completely. A second limitation is that although Web of Science, which is used as a database in our study, contains the most valuable documents published, it does not contain all the articles on the subject. For this reason, all the documents published worldwide were not taken into consideration.

The increasingly interdisciplinary, complex, and costly characteristics of modern science encourage scientists to get involved in collaborative (17). Hypertension during pregnancy is an area where both obstetricians and cardiologists have to work together. The number of articles published on this subject has increased rapidly in the last decade. This increase in both the number of published articles and the number of citations indicates that the subject will become more popular in the coming period. With our analysis, both clinicians and researchers will be able to easily identify which articles about hypertension in pregnancy are popular and which topics are more cited. We believe that our analyses will be a guide for studies involving the cardiovascular system and obstetric diseases.

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*Conflict of Interest:* The authors declare that they have no conflict of interest.

*Ethics Committe:* Bibliometric analysis, ethics committe approval is not required.

## REFERENCES

1. ACOG Committee on Practice Bulletins--Obstetrics. ACOG practice bulletin. Diagnosis and management of preeclampsia and eclampsia. Number 33, January 2002. *Obstet Gynecol.* 2002;99(1):159-67.
2. Crowhurst, JA, Plaat F. Why mothers die report on confidential enquiries into maternal deaths in the United Kingdom 1994–96. *Anaesthesia.* 1999;54(3):207-9.
3. Duley, L. Maternal mortality associated with hypertensive disorders of pregnancy in Africa, Asia, Latin America and the Caribbean. *BJOG.* 1992; 99(7), 547-553.
4. Myatt L, Clifton RG, Roberts JM., Spong CY, Hauth JC, Varner MW et al. First-trimester prediction of preeclampsia in low-risk nulliparous women. *Obstetrics and gynecology.* 2012;119(6):1234.
5. Hood W, Wilson C. The literature of bibliometrics, scientometrics, and informetrics. *Scientometrics.* 2001;52(2):291-314.
6. Pritchard A. Statistical bibliography or bibliometrics. *Journal of Documentation.* 1969;25(4):348-49.
7. Clark SL, Christmas JT, Frye DR., Meyers JA, Perlin JB. Maternal mortality in the United States: predictability and the impact of protocols on fatal postcesarean pulmonary embolism and hypertension-related intracranial hemorrhage. *American Journal of Obstetrics and Gynecology.* 2014;211(1):32-e1.
8. Bernhart F. Geschichte, Wesen und Behandlung der Eklampsie. *Wien Klin Wchschr.* 1939;52(1003-1009):1036-43.
9. Brown MA, Buddle ML. What's in a name? Problems with the classification of hypertension in

- pregnancy. *Journal of Hypertension*. 1997;15:1049-54
10. Staff AC, Sibai BM, Cunningham FG. Prevention Preeclampsia and Eclampsia. Taylor RN, Roberts JM, Cunningham FG, Lindheimer MD. In: Chesley's Hypertensive Disorders in Pregnancy, 4th ed. USA. Academic Press, 2015:253-67.
  11. Myers JE, Brockelsby J. The epidemiology of pre-eclampsia. In: Baker P, Kingdom J, eds. Pre-Eclampsia: current perspectives on management. Parthenon Publ Gr USA. 2004; 25-39.
  12. Yücedağ M, Yılmaz O, Kırteke K, Özün Özbay P, Küme T. Preeklampitik ve normotensiv gebe kadınlar arasında serum adrenomedullin düzeylerinin kıyaslanması. *Dokuz Eylül Üniversitesi Tıp Fakültesi Dergisi*. 2020;34(2):85-91. Doi.org/10.5505/deutfd.2020.94834.
  13. Walker JJ. Pre-eclampsia. *The Lancet*. 2000;356(9237):1260-65.
  14. Oakley C, Warnes CA. Heart disease in pregnancy. 2nd ed. Hong Kong. Blackwell Publishing, 2008.
  15. Tasli L, Kacar N, Aydemir EH. Scientific productivity of OECD countries in dermatology journals within the last 10-year period. *International journal of dermatology*. 2012;51(6):665-71.
  16. Man JP, Weinkauff JG, Tsang M, Sin JHDD. Why do some countries publish more than others? An international comparison of research funding, English proficiency and publication output in highly ranked general medical journals. *European journal of epidemiology*. 2004;19(8):811-17.
  17. Lee S, Bozeman B. The impact of research collaboration on scientific productivity. *Social studies of science*. 2005;35(5):673-702.