

Bibliometrics and Visual Analysis of the Research Status and Trends of Breastfeeding in Turkey

Tuba Uçar¹, Osman Tayyar Çelik², Esra Sabancı Baransel¹, Sümeyye Barut³

¹Department of Midwifery, İnönü University, Malatya, Turkey

²Department of Child Development, İnönü University, Malatya, Turkey

³Department of Midwifery, Fırat University, Elazığ, Turkey

What is already known on this topic?

- As international organizations and non-governmental organizations have declared breastfeeding as a priority area to be encouraged and supported, studies in the field of breastfeeding in the last 20 years have gained importance at the national and international scales.
- Most research has been about breastfeeding initiation and infant feeding practices.
- The question of which standard breastfeeding indicators and which intervention programs are the most effective in improving breastfeeding indicators remains unanswered.

What this study adds on this topic?

- This study provides information on current trends and important areas of breastfeeding research in Turkey.
- The results of this study revealed that the most popular topics related to breastfeeding were the factors affecting breastfeeding and the effects of breastfeeding, and the interest of scientists in breastfeeding was limited.
- International collaboration should be prioritized for future studies examining different aspects of breastfeeding and for the development and advancement of related research.

Corresponding author:

Sümeyye Barut

✉ smyybrt2344@hotmail.com

Received: March 30, 2023

Accepted: June 15, 2023

Publication Date: August 9, 2023

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



ABSTRACT

Objective: The long- and short-term benefits of breastfeeding for mothers and infants are known, and the number of studies on this subject is increasing daily. This study aimed to reveal current research trends, hotspots, and future frontiers in research on breastfeeding in Turkey.

Materials and Methods: The most productive institutions, influential authors, the journals with the most publications by the authors, core research teams, and keywords in Turkey in the field of breastfeeding were analyzed using bibliometric methods. Additionally, breastfeeding-related articles published in the Web of Science Core Collection between 1980 and 2022 were scanned. The collected data were analyzed with the R Bibliometrix package program and VOSviewer.

Results: It was determined that research on breastfeeding has accelerated since 2004, and the number of citations has increased with the number of publications. The fields of most productive writers in the area were found as social pediatrics, and the most influential institutions were İstanbul University and Hacettepe University. It was determined that there was no specialization in research on breastfeeding among authors distributed based on their productivity. The results also revealed the most influential articles and journals. The word analysis revealed that the breastfeeding literature in Turkey is sensitive to current developments, whereas the current status of breastfeeding, the factors affecting breastfeeding, and the effects of breastfeeding are the top areas of research. It was observed that maternal attachment and coronavirus disease-2019 (COVID-19) pandemic-related issues have been studied more in recent years.

Conclusion: This bibliometric analysis contributes to understanding the current status and development of breastfeeding research in Turkey.

Keywords: Breastfeeding, bibliometrics, research, Turkey

INTRODUCTION

Breastfeeding is the most appropriate form of nutrition for the growth and development of infants which concerns maternal and infant health. Evidence supporting breastfeeding includes the reduced risk of sudden infant death syndrome,¹⁻³ positive effects on the infant immune system,^{1,2,4} protection against obesity and diabetes,^{1,2,5} a positive impact on cognitive development,^{1,6} a reduced likelihood of abuse,⁷ and a reduced risk of some pediatric cancers.^{1,8} Additionally, infants who are breastfed are less likely to develop infectious diseases such as gastroenteritis, lower and upper respiratory tract diseases, and middle ear infections; these factors reduce hospitalization, morbidity, and mortality rates.⁹ For premature infants, breastfeeding reduces the risk of developing necrotizing enterocolitis.¹⁰ Breast milk contains many non-pathogenic bacteria that are transferred to the baby for the development of a healthy intestinal microbiota,¹¹ and it was reported that breastfeeding may be protective against celiac disease.¹² Breastfeeding also benefits women by protecting them

Cite this article as: Uçar T, Çelik OT, Sabancı Baransel E, Barut S. Bibliometrics and visual analysis of the research status and trends of breastfeeding in Turkey. *Turk Arch Pediatr.* 2023. [epub ahead of print]

against type 2 diabetes, hypertension, cardiovascular diseases, and postpartum weight loss^{1,13} and reducing the risk of breast and ovarian cancer.¹ Additionally, breastfeeding can facilitate mother–infant bonding.¹⁴

The benefits of breastfeeding are more pronounced when the infant is exclusively breastfed for the first 6 months of life, and breastfeeding continues for 2 years.¹⁵ The World Health Organization (WHO) also recommends exclusive breastfeeding for the first 6 months after birth and breastfeeding with appropriate complementary foods until the age 2 and beyond.¹⁶ Additionally, the Ministry of Health of the Republic of Turkey (2017) forces that infants should be fed exclusively with breast milk from birth to 6 months of age.¹⁷ Despite these recommendations, global trends show that women breastfeed for shorter periods nowadays.^{18,19} According to United Nations Children's Fund (UNICEF) data (2021), the proportion of women who exclusively breastfeed during the first 6 months of the postpartum period worldwide is 48%.²⁰ Based on the 2018 data obtained from the Turkey Demographic and Health Survey (TDHS), the rate of women breastfeeding within the first hour after childbirth was 71%, while the rate of exclusive breastfeeding in the first 6 months decreased to 40.7%.²¹

The continuation of breastfeeding is a complex process influenced by many factors.²² One of the reasons why breastfeeding rates are falling around the world is the increasing trend toward formula usage. Especially with the industrial revolution, infant foods have been widely used, and advertisements arguing that formula is superior to breast milk have been produced. For this reason, the importance given to breast milk has gradually decreased, breastfeeding rates have unfortunately dropped, and there has been a rapid increase in infant mortality.²³ Exclusive breastfeeding has been identified as a priority area by international organizations and non-governmental organizations to be supported and promoted. Therefore, in the last 2 decades, studies in the field of breastfeeding have become increasingly important at the national and global scales. The fact that exclusive breastfeeding for the first 6 months is below the targeted rate, especially according to the TDHS data, has increased the interest in breastfeeding studies in Turkey.²⁴ However, most studies are about the time of breastfeeding initiation and infant feeding practices. Nevertheless, the question remains on which trend of standard breastfeeding indicators and which elements of past and current preventive intervention programs are the most effective in improving breastfeeding indicators. Therefore, it is necessary to broaden and deepen the focus of research on breastfeeding.

The bibliometric method and data visualization technology can be used to assess research trends at both the national and international scales. These methods are widely used in medicine, science, and technology.²⁵ Especially in recent years, the increase in the number of scientific publications makes it difficult to examine the relevant literature as a whole. For this reason, the need for bibliometric studies to reveal the general view, structure, and trends of studies on certain subjects has risen. Bibliometric studies can provide an objective, general view of the research area that is studied, and map the social structure that presents the development and current state of the aforementioned research area.²⁶ While a limited number

of studies examining research on breastfeeding in specific regions using bibliometric methods have been found,^{27,28} there have yet to be studies showing a comprehensive picture of the literature on breastfeeding in Turkey. To our knowledge, this is the first study to investigate breastfeeding research trends in Turkey over the past 4 decades using bibliographic measures and data visualization technology. Therefore, this study has the potential to significantly help scientists understand the current situation and future trends in breastfeeding studies in Turkey. Based on the review of the relevant literature, this study explores the research status, hotspots, and limitations regarding research on breastfeeding. Additionally, the findings of this study may point to research directions for Turkish academics working in the field of breastfeeding, and researchers worldwide can apply these methodologies. The aim of this study is to analyze breastfeeding studies conducted in Turkey using bibliometric methods and make a comprehensive evaluation to understand the trends in breastfeeding, the relationships between publications, and the organization within the discipline. In this context, the following questions were addressed by focusing on a large set of documents covering the literature on breastfeeding in Turkey:

- (1) What are the publishing trends in breastfeeding between 1980 and 2022?
- (2) What journals do researchers prefer?
- (3) What are the most productive organizations and authors?
- (4) What is the nature of the co-authorship collaborations of researchers?
- (5) What are the frequently used keywords in the literature on breastfeeding?

MATERIAL AND METHODS

In this study, studies in the field of breastfeeding in Turkey were examined using the bibliometric method. The bibliometric method is a quantitative method used to reveal the intellectual, social, and conceptual structures and evolutionary foundations of a field in the literature. This method makes it possible to evaluate performance in the context of publication and citation counts.²⁹ The bibliometric method was used to examine the number of articles published in the field of breastfeeding and citations, the most productive institutions, key authors, core research teams, and keywords. Additionally, quantitative content analysis was applied to examine all research articles published in the field of breastfeeding between 1980 and 2022. The results were analyzed using descriptive methods, bibliometric analysis, and bibliometric mapping.

Data Collection and Search Strategy

The Web of Science (WoS) Core Collection was chosen as the database. WoS includes 4 citation indexes [Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Emerging Sources Citation Index (ESCI)] and more than 10 000 international scientific journals with high impact factors.³⁰ In this context, it was decided to conduct searches on this database since WoS allows in-depth research.

First, keywords were determined by examining more than 50 studies on breastfeeding on the Google Academic and WoS databases. With these keywords specified in the second stage,

attempts were made to create the most appropriate key index in the WoS database. Finally, with the advanced search strategy, a search was made on December 7, 2022 using the following key index.

(TI=(“Breast Feeding, Exclusive” or “Breastfeeding, Exclusive” or “Exclusive Breast Feeding” or “Exclusive Breastfeeding” or “Breast feeding” or “Breastfeeding” or “Breast Fed” or “Breastfed”)) OR (AK=(“Breast Feeding, Exclusive” or “Breastfeeding, Exclusive” or “Exclusive Breast Feeding” or “Exclusive Breastfeeding” or “Breast feeding” or “Breastfeeding” or “Breast Fed” or “Breastfed”)) NOT TS=(“cow” or “monkey” or “cattle” or “bovine” or “rat” or “cat” or “swine” or “pig”)

Specification and Selection of Studies

In the first search, 27 347 articles were reached without using any filters. Then, some filtering was applied to identify sources directly related to breastfeeding in the relevant literature. In the filters that were used, “Turkey” (n = 606) was chosen as the region, “article or review” (n = 523) was chosen as the document type, and “SCIE, SSCI, ESCI” (n = 523) was chosen as the index.

Extraction and Analysis of Data

The titles and abstracts of a total of 523 articles were reviewed one by one by the researchers, and 9 publications that were not related to the subject were excluded from the study. During the screening, the focus was on studies in the field of human health. Breastfeeding studies on animals and studies examining the chemical contents of breast milk were not included in the analysis. The information from the remaining articles was recorded as bibliometric indicators. As a result, 514 articles published between 1980 and 2022 were included in the study.

Statistical Analysis

In this study, measurements such as the number of publications, the number of citations, and word frequencies were used for bibliometric analyses. We aimed to determine the publication trends in the field of breastfeeding by examining the distribution of publications by years. We also analyzed the keyword formation network to understand the conceptual structure of the breastfeeding literature by looking at the frequency of use of keywords by year. Additionally, analyses were conducted to determine the publication trends in recent years. The frequency of use of keywords by years allows us to understand the conceptual structure of the breastfeeding literature. In this analysis step, the relationships and trends among keywords were examined. Keyword formation network analysis shows which concepts are at the forefront of

breastfeeding-related research and how these concepts are related to each other.

The metadata of 514 articles accessed from the WoS database were downloaded in plain text format and uploaded to the Bibliometrix analysis package. The analyses of the articles were carried out using the open-source R Bibliometrix package program and the VOSviewer software. The Bibliometrix program is used for both performance analysis and scientific mapping.²⁹ The Biblioshiny application, which provides a web-based graphical interface for Bibliometrix, was also used in the analysis process. The distribution of the number of publications and citations in the breastfeeding literature by years, the distribution of the number of publications and citations by authors, the analysis of author productivity according to Lotka’s law, the distribution of publications according to institutions and journals, and the analysis of trending topics in the breastfeeding literature were included using the R Bibliometrix package program. The VOSviewer program, on the other hand, was used to visualize the analysis results and bibliometric analysis processes.³¹ Here, co-author, partner institution, and co-word analysis results were visualized with VOSviewer and demonstrated by network analysis. Network analysis formally visualizes the relationships of individuals, institutions, or objects within a social system.³² Co-word analysis enables us to identify the dominant research topics in an area, create conceptual structures, and visualize the relationships between these structures.^{31, 33}

Ethical Approval

Ethical approval for the study was received from the Health Sciences Scientific Research and Publications Ethics Committee (Decision no. 2023/ 4618).

RESULTS

Time Trend of Publication Outputs

The distribution of the numbers and citations of 514 articles published between 1980 and 2022 determined as a result of the screening strategy that was applied in this study is given in Figure 1. It was determined that the number of publications on breastfeeding has started to increase since 2000, and the increase has accelerated since 2004, but the increase in the last 5 years has been the fastest. It was seen that the number of citations to publications has increased in direct proportion to the number of articles over the years.

Most Productive and Influential Authors

The most productive and influential authors in the breastfeeding literature in Turkey, according to the numbers of their citations, are given in Table 1. The 3 most prolific authors on breastfeeding were G. Gokcay, S.S. Yalcin, and F. Uguz, respectively. Looking at their fields of study, G. Gokcay primarily studied knowledge, attitudes, and practices related to breastfeeding, S.S. Yalcin primarily studied breast milk content, breastfeeding techniques, and breastfeeding behaviors in different societies, and F. Uguz primarily studied mood during breastfeeding and drug and antipsychotic use while breastfeeding. Considering the fields of these authors, G. Gokcay and S.S. Yalcin’s mutual field was social pediatrics, and F. Uguz’s field was psychiatry. According to the number of citations to the articles published by different authors, the most influential authors were S.S. Yalcin, S. Kucukoglu, and F. Uguz, respectively. S. Kucukoglu, one of

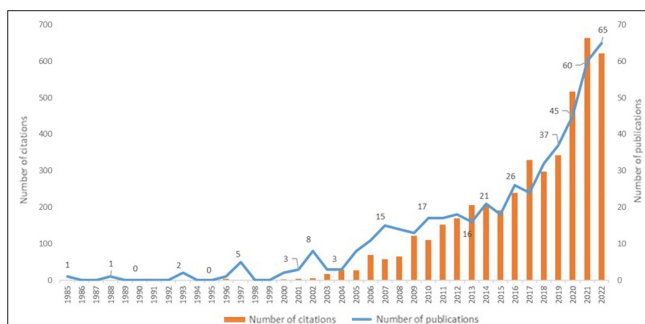


Figure 1. Distribution of publications and citations by years.

Table 1. Author Rankings by Number of Publications and Local Citations (n = 1604)

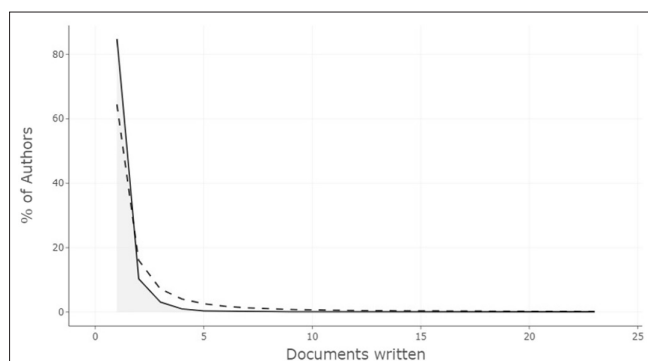
Author	Number of Publications	%	Number of Local Citations
G. Gokcay	23	1.4	10
S.S. Yalcin	19	1.1	31
F. Uguz	12	0.7	15
S. Kucukoglu	9	0.5	16
S. Yalcin	8	0.4	11
N. Cinar	7	0.4	1
K. Yurdakok	7	0.4	12
P. Boran	6	0.3	2
A.D. Camurdan	6	0.3	4
B. Kural	6	0.3	2
Total	103		

these authors, has conducted studies on breastfeeding self-efficacy and support. S. Kucukoglu's field is pediatric nursing.

Author productivity was also examined according to Lotka's law. Lotka's law expresses the distribution of the contributions of the authors to a particular literature in a given period.³⁴ The distribution of the productivity levels of authors contributing to the breastfeeding literature that was determined according to this law is presented in Figure 2. Considering the results of the productivity analysis of the authors according to Lotka's law, it is understood that the rate of the authors with 1 publication on breastfeeding was 84% (n = 1359 authors), the rate of the authors with 2 relevant publications was 10% (n = 165 authors), and the rate of the authors with 3 relevant publications was 3% (n = 49 authors).

Most Influential Publications

Citations in bibliometric analyses can be analyzed as local and global citations. While the citations in the specific field studies included in the bibliometric analysis are taken as references in the local citation category, the global citation category includes all citations in WoS, albeit in the mapping of different subjects.²⁷ Since this study aimed to identify influential articles in the breastfeeding literature, the 10 most influential articles, according to their local citations in the last 42 years, are presented in Table 2.^{19,35-43} As seen in Table 2, the study in which a breastfeeding self-efficacy scale was adapted to Turkish, and its psychometric properties were examined by Tokat et al³⁵ was

**Figure 2.** Distribution of authors with publications on breastfeeding according to Lotka's law.

the most locally cited study. Although Ertem et al's⁴² study on the timing and determinants of early termination of breastfeeding had a low number of local citations, it was the article with the highest number of global citations. Table 2 shows that the majority of the most frequently cited articles were published in the "Turkish Archives of Pediatrics."

Most Relevant Institutions

The distribution of studies in the field of breastfeeding in Turkey by institutions is given in Figure 3. İstanbul University has produced the largest number of articles in the last 42 years, with 86 articles. Hacettepe University ranked second with 66 articles, while other universities have produced similar number of articles.

Most Relevant Journals

The journals published on breastfeeding were examined, and the 10 most relevant journals are presented in Table 3. It was seen that the 10 journals with the highest numbers of publications on breastfeeding included 48 publications representing 20.5% of the studies included in the analysis. It was observed that the 3 journals with the most publications were *Breastfeeding Medicine*, *Turkish Journal of Pediatrics*, and *Journal of Human Lactation*, respectively.

Networks of Authors

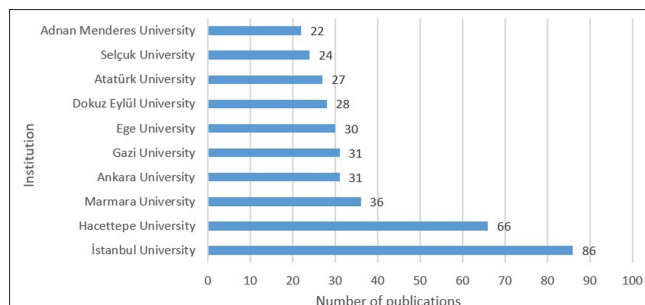
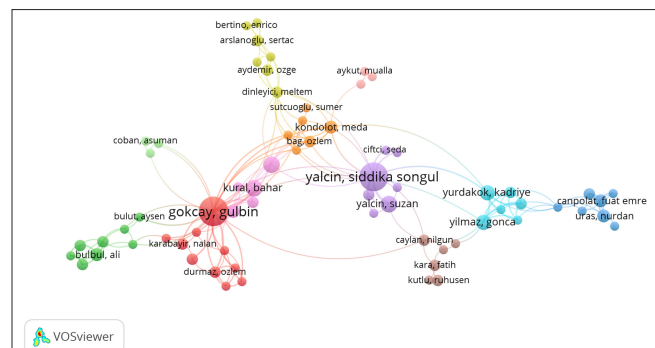
The result of the co-author analysis of studies in the field of breastfeeding in Turkey is given in Figure 4. On the map, each circle represents an author, the size of the circle depicts the number of co-authored articles published, and the lines between the circles represent the strength of collaborations among the authors. Co-authors on the map are in the same cluster. According to the results of the analysis, G. Gokcay and S.S. Yalcin were relatively related to other clusters at the center. The standard citations of these authors in different studies showed that they significantly contributed to the knowledge of the breastfeeding literature in Turkey. In the clusters, it is seen that G. Gokcay, who has studied in the field of knowledge, attitudes, and practices related to breastfeeding, stood out in the red cluster, which had a high strength of connection to other clusters. Other authors in this cluster jointly worked on the effects of breast milk and breastfeeding on the mother and the infant. Looking at the purple cluster, S.S. Yalcin, who has publications on breast milk content, breastfeeding practices, and breastfeeding behaviors in different societies, was the author with the highest strength of connection. G. Yilmaz, who works on factors affecting breastfeeding and breastfeeding support in the turquoise cluster, was at the center of the cluster, while B. Kural, who works on breastfeeding attitudes and practices, was at the center of the pink cluster.

Interinstitutional Networks

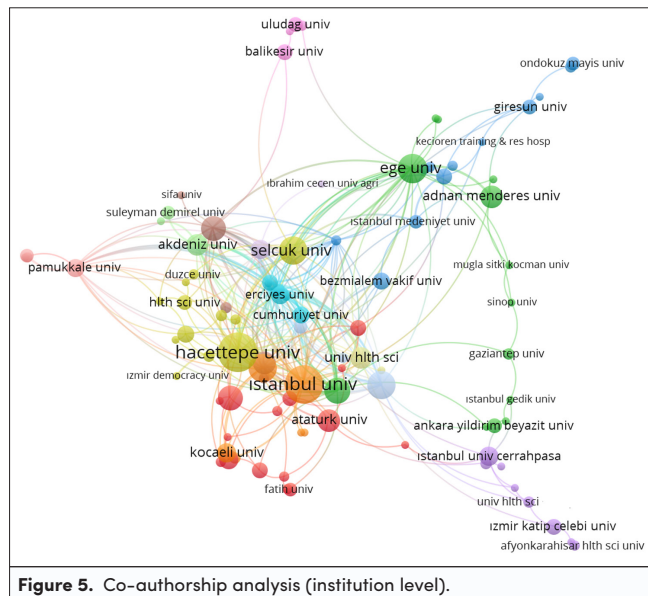
The result of the co-author analysis in the context of interinstitutional collaboration is presented in Figure 5. On the map, it can be seen that İstanbul University and Hacettepe University had the most comprehensive collaboration network with other institutions, where they played a central role in studies on breastfeeding. Additionally, institutions such as Selçuk, Ege, Dokuz Eylül, and Ankara University were prominent institutions in the number of their publications and their collaborations. On the other hand, Pamukkale University, which had a co-authorship network of many different clusters, was relatively off the map.

Table 2. Articles with the Highest Numbers of Citations

No	Author (year)	Article Title	Number of Local Citations	Number of Global Citations
1	Tokat et al ³⁵	Translation and psychometric assessment of the Breast-feeding Self-Efficacy Scale—Short Form among pregnant and postnatal women in Turkey	34	75
2	Karaçam and Sağlık ¹⁹	Breastfeeding problems and interventions performed on problems: Systematic review based on studies made in Turkey	11	23
3	Cakmak and Kuguoglu ³⁶	Comparison of the breastfeeding patterns of mothers who delivered their babies per vagina and via cesarean section: an observational study using the LATCH breastfeeding charting system	10	53
4	Şahin et al ³⁷	Risk factors for breastfeeding problems in mothers who presented to two public healthcare centers in Kayseri province	10	12
5	Karacam ³⁸	Factors affecting exclusive breastfeeding of healthy babies aged zero to four months: A community-based study of Turkish women	9	23
6	İnce et al ³⁹	Evaluation of the factors affecting mothers' breastfeeding self-efficacy and breastfeeding success	9	10
7	Ergenekon-Ozelci et al ⁴⁰	Breastfeeding beliefs and practices among migrant mothers in slums of Diyarbakir, Turkey, 2001	8	40
8	Gerçek et al ⁴¹	The relationship between breastfeeding self-efficacy and LATCH scores and affecting factors	8	23
9	Ertem et al ⁴²	The timing and predictors of the early termination of breastfeeding	7	143
10	Örün et al ⁴³	Factors associated with breastfeeding initiation time in a Baby-Friendly Hospital	7	33

**Figure 3.** Number of articles by institutions.**Figure 4.** Co-authorship analysis (author level).**Table 3.** The 10 Most Relevant Journals in the Field of Breastfeeding

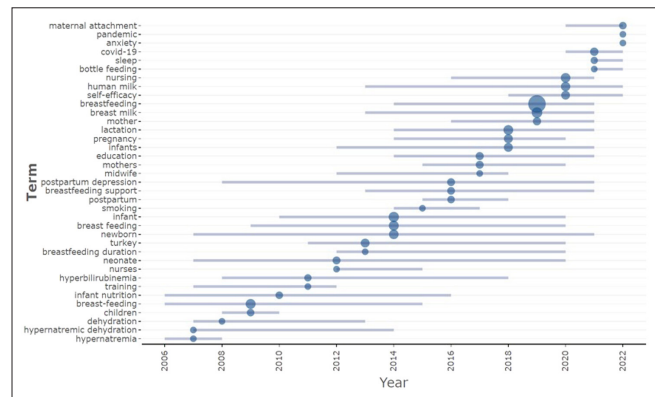
Journal	Number of Publications	%	Impact Factor
<i>Breastfeeding Medicine</i>	48	20.5	2.649
<i>Turkish Journal of Pediatrics</i>	21	8.9	0.823
<i>Journal of Human Lactation</i>	15	6.4	2.88
<i>Turkish Archives of Pediatrics</i>	14	5.9	–
<i>Health Care for Women International</i>	11	4.7	1.633
<i>Journal of Maternal-Fetal & Neonatal Medicine</i>	8	3.4	2.22
<i>Journal of Pediatric Research</i>	8	3.4	0.07
<i>Journal of Current Pediatrics</i>	7	2.9	0.03
<i>Pediatrics International</i>	7	2.9	1.555
<i>Florence Nightingale Journal of Nursing</i>	6	2.5	–
Total	145		



Co-word Analysis

The result of the co-word analysis used for the field of breastfeeding in Turkey is presented in Figure 6. The map in Figure 6 has 207 nodes, each representing a keyword. The node size represents the frequency of usage of the keyword. Thus, we determined the focus of research in the field of breastfeeding. The results showed that breastfeeding, human milk, child, infants, nursing, Turkey, and lactation dominated breastfeeding research.

Trending topics in the research field of breastfeeding in recent years are presented in Figure 7. The lines represent the place of the subjects in the timeline, while the nodes indicate the frequencies of words. Longer lines show that the issue was up to date. As seen in Figure 7, infant nutrition, newborn, neonate, and postpartum depression as research areas have been studied for a long time and remained on the agenda for many years. Considering the trends in recent years, it is seen that the topics of maternal attachment ($n = 7$), pandemic ($n = 5$), anxiety ($n = 5$), COVID-19 ($n = 12$), sleep ($n = 6$), bottle feeding



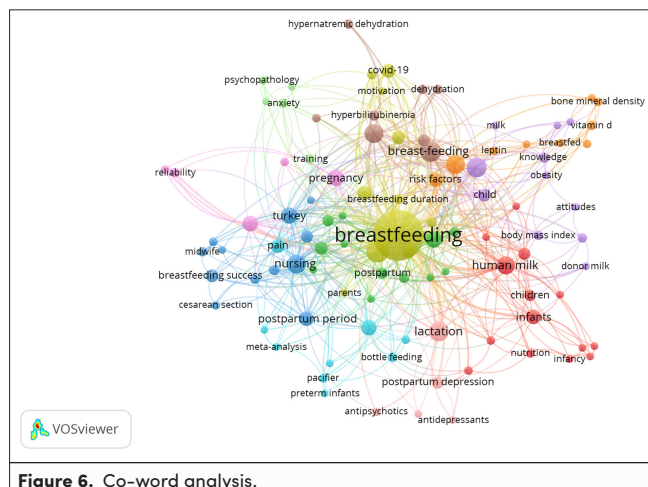
($n = 5$), nursing ($n = 26$), human milk ($n = 23$), and self-efficacy ($n = 16$) have come to the fore.

DISCUSSION

This study revealed the current trends and changing developments in breastfeeding studies in Turkey by applying bibliometric methods to scientific publications. Thus, it clarified the trends in the breastfeeding literature in Turkey in the last 42 years.

The number of articles published in a particular field is an important index that is used to measure the development of scientific research. To a certain extent, this reflects the knowledge of the subject by scientists and the progress of research in the relevant field.⁴⁴ The data in our study showed that breastfeeding research in Turkey has attracted constant attention and developed steadily. However, it was determined that studies have shown a slow course of development, especially before 2000, and the number of studies has increased rapidly since 2004. Changes in the number of articles published each year may be related to a set of measures and policies implemented at the national level. The “Global strategy for infant and young child feeding” approved by WHO and UNICEF has provided a framework in Turkey and the rest of the world for urgent action with resources available at the national level.⁴⁵ Determining breastfeeding-related strategies may have accelerated relevant studies as an essential turning point. The number of citations has also shown a steady increase over the years. This confirms that research in the field of breastfeeding in Turkey has always attracted the attention of both national and international scientists.

Regarding authors focusing on breastfeeding, the analysis results showed that G. Gokcay was the most prolific author, while S.S. Yalcin was the most cited author. The field of these 2 authors is also social pediatrics, and we found that their work focused on breastfeeding practices in common. Social pediatrics is a branch of science that supports the child’s healthy life and focuses on techniques that protect and improve health. Therefore, our findings can also be interpreted as scientists in the field of social pediatrics supporting breastfeeding and contributing to the literature through breastfeeding studies. Additionally, in our study, strong collaborations were found between G. Gokcay and S.S. Yalcin in terms of common citations in the relevant literature. While there was a national



collaboration overall in the co-authorship analysis, it is noteworthy that there were not enough joint studies with international authors.

Among the articles on breastfeeding, the most cited articles in terms of the numbers of local and global citations belonged to different authors. The article with the greatest number of local citations was a current scale adaptation study that could be used as a source for other breastfeeding studies (Table 2, number of local citations: 34). On the other hand, the article with the highest number of global citations was a publication that dealt with the timing and determinants of early termination of breastfeeding, which is a common area of many disciplines (Table 2, number of global citations 143).

Considering the productivity of authors according to Lotka's law, the rate of authors contributing to one publication was considerably higher than the rate of all authors. For this reason, it can be stated that the interest of authors who have published in the field of breastfeeding is limited, there has been no specialization in the field of breastfeeding for these authors, and sufficient productivity has not been reached. This suggested that the topic of breastfeeding deserves more attention from scientists. However, since the 3 journals in which breastfeeding studies have been published the most frequently (*Breastfeeding Medicine*, *Turkish Journal of Pediatrics*, and *Journal of Human Lactation*) will provide specific information about breastfeeding, they can be suitable platforms for publication while providing an essential source of information for researchers.

Scientific research institutions are an essential source of scientific research output, mainly representing the local extent and strength of scientific research.²⁵ We determined that İstanbul University and Hacettepe University were the most vital institutions regarding the number of articles and collaboration in breastfeeding studies in Turkey. This finding indicated that these 2 institutions have had strong scientific outputs in the context of breastfeeding studies. An institution's scientific research capacity is often closely related to local levels of economic and cultural development.⁴⁵ The results of this study may be related to the fact that these 2 institutions are located in the 2 largest cities of Turkey, which have more developed economies and provide relatively unhindered and convenient access to information. Additionally, these institutions are among the oldest and most well-established universities in Turkey, and many researchers in these institutions are working in the field of newborns. Additionally, both universities have social pediatrics doctorate programs. Considering the benefits of breastfeeding for the mother and the infant, all institutions should emphasize this issue. However, there are regional differences in the distribution of studies according to institutions regarding the number of publications and collaborations. It was determined that scientists from the universities in the western parts of Turkey have dominated the breastfeeding literature. Additionally, while scientists at Atatürk University in the east contributed significantly to the breastfeeding literature, it was observed that other universities in the east were not included among the top 10 universities.

In the analysis of the most frequently used keywords in the breastfeeding literature in Turkey, we found that the current

state of breastfeeding, the factors affecting breastfeeding, and the topics (breastfeeding, body mass index, human milk, newborn, infant, nursing, lactation, and growth) providing information about the effects of breastfeeding were the top research areas. World Health Organization and UNICEF (2018) have identified exclusive breastfeeding as a priority area and set global targets such as increasing the proportion of exclusively breastfed children for the first 6 months to 50% by 2025 and to at least 70% by 2030.⁴⁶ Furthermore, WHO calls for increased national and international program development efforts to achieve these goals. Therefore, many studies have examined the current state of breastfeeding rates, the causes of the present decline, and barriers to breastfeeding.^{47,48} It is not surprising that the number of such studies has been high in the literature after confirming the importance of breastfeeding in Turkey and setting goals to increase breastfeeding rates.

Considering the general trend in the breastfeeding literature in recent years, it can be stated that psychosocial dimensions of breastfeeding, such as attachment and anxiety, have been intensively addressed in research and introduced to the breastfeeding literature with the emergence of the COVID-19 pandemic in December 2019. The increase in the interest in attachment in breastfeeding indicates social awareness. Indeed, it was reported that breastfeeding is associated with secure attachment.⁴⁹ Demonstrating the several benefits of breastfeeding has made it essential to develop intervention programs to support breastfeeding.

To our knowledge, this is the first study to quantitatively analyze the number of articles published in the field of breastfeeding in Turkey and their citations, the most productive institutions, key authors, core research teams, and keywords. However, there were some limitations in this study. First, only the WoS database was searched in the study, but other databases such as Scopus and PubMed were not examined to avoid the repetition of publications. Future studies can provide analyses by reaching more publications via more databases. Second, most of the included publications were in English, so there may have been a linguistic bias. Another limitation was that in this study, articles and reviews from the database were determined to be included in the bibliometric analysis to shed light on studies in the breastfeeding literature, while books and book chapters were not included.

CONCLUSION

This study presents information on current trends and important areas of breastfeeding research in Turkey. The bibliometric analysis identified the current state of breastfeeding studies and some notable gaps. The number of articles published on breastfeeding in Turkey is increasing yearly and attracts the attention of researchers. This study showed that strong and well-established universities in Turkey play a leading role in the breastfeeding literature. The most popular topics are the current state of breastfeeding, the factors affecting breastfeeding, and the effects of breastfeeding. However, it was determined that the interest of scientists in breastfeeding is limited. Therefore, collaboration with international authors should be promoted in the future to conduct studies examining different dimensions of breastfeeding and encourage the development and progress of such research.

Ethics Committee Approval: This study was approved by Ethics Committee of İnönü University Health Sciences Scientific Research and Publications (Approval No: 4618, Date: May 9, 2023).

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – T.U., O.T.Ç., E.S.B., S.B.; Design – T.U., O.T.Ç.; Supervision – T.U., O.T.Ç.; Resources – E.S.B., S.B.; Materials – E.S.B., S.B.; Data Collection and/or Processing – E.S.B., S.B.; Analysis and/or Interpretation – T.U., O.T.Ç.; Literature Search – T.U., O.T.Ç., E.S.B., S.B.; Writing– T.U., O.T.Ç.; Critical Review – T.U., O.T.Ç.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: This study received no funding.

REFERENCES

- Gertosio C, Meazza C, Pagani S, Bozzola M. Breastfeeding and its gamut of benefits. *Minerva Pediatr.* 2016;68(3):201-212.
- United States Preventive Services Task Force, Bibbins-Domingo K, Grossman DC, et al. Primary care interventions to support breastfeeding: US Preventive Services Task Force Recommendation Statement. *JAMA.* 2016;316(16):1688-1693. [CrossRef]
- Thompson JMD, Tanabe K, Moon RY, et al. Duration of breastfeeding and risk of SIDS: an individual participant data meta-analysis. *Pediatrics.* 2017;140(5). [CrossRef]
- Quigley MA, Carson C, Sacker A, Kelly Y. Exclusive breastfeeding duration and infant infection. *Eur J Clin Nutr.* 2016;70(12):1420-1427. [CrossRef]
- Wang X, Martinez MP, Chow T, Xiang AH. BMI growth trajectory from ages 2 to 6 years and its association with maternal obesity, diabetes during pregnancy, gestational weight gain, and breastfeeding. *Pediatr Obes.* 2020;15(2):e12579. [CrossRef]
- Choi HJ, Kang SK, Chung MR. The relationship between exclusive breastfeeding and infant development: a 6- and 12-month follow-up study. *Early Hum Dev.* 2018;127:42-47. [CrossRef]
- Tagiyev A, Yalçın S. Protective role of breastfeeding status, chronic health problems, and temperament of children in maltreatment by mothers. *Turk Arch Pediatr.* 2021;56(2):152-158. [CrossRef]
- Amitay EL, Keinan-Boker L. Breastfeeding and childhood leukemia incidence: a meta-analysis and systematic review. *JAMA Pediatr.* 2015;169(6):e151025. [CrossRef]
- Branger B, Bainier A, Martin L, et al. Breastfeeding and respiratory, ear and gastro-intestinal infections, in children, under the age of one year, admitted through the paediatric emergency departments of five hospitals. *Front Pediatr.* 2023;10:2359. [CrossRef]
- Herrmann K, Carroll K. An exclusively human milk diet reduces necrotizing enterocolitis. *Breastfeed Med.* 2014;9(4):184-190. [CrossRef]
- Güney R, Çınar N. Anne sütü ve mikrobiyota gelişimi. *J Biotechnol Strateg Health Res.* 2017;1:17-24.
- Štšepetova J, Simre K, Tagoma A, et al. Maternal breast milk microbiota and immune markers in relation to subsequent development of celiac disease in offspring. *Sci Rep.* 2022;12(1):6607. [CrossRef]
- Kirkegaard H, Bliddal M, Størring H, et al. Breastfeeding and later maternal risk of hypertension and cardiovascular disease – the role of overall and abdominal obesity. *Prev Med.* 2018;114:140-148. [CrossRef]
- Peñacoba C, Catala P. Associations between breastfeeding and mother–infant relationships: a systematic review. *Breastfeed Med.* 2019;14(9):616-629. [CrossRef]
- Karimi FZ, Miri HH, Khadivzadeh T, Maleki-Saghooni N. The effect of mother–infant skin-to-skin contact immediately after birth on exclusive breastfeeding: a systematic review and meta-analysis. *J Turk Ger Gynecol Assoc.* 2020;21(1):46-56. [CrossRef]
- World Health Organization. *Indicators for Assessing Infant and Young Child Feeding Practices: Definitions and Measurement Methods.* Geneva: World Health Organization, The United Nations Children's Fund (UNICEF); 2021. Available at: <https://apps.who.int/iris/handle/10665/340706>. Accessed January 19, 2023.
- T.C. Sağlık Bakanlığı. *Anne Sütünün Teşviki ve Bebek Dostu Sağlık Kuruluşları Programı.* T.C. Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu Çocuk ve Ergen Sağlığı Dairesi Başkanlığı; 2017. Available at: <https://hsgm.saglik.gov.tr/tr/cocukergen-bp-liste/anne-s%C3%BCt%C3%BCn%C3%BCn-te%C5%9Fviki-ve-bebek-dostu-sa%C4%B1k%C4%B1k-kurulu%C5%9Flar%C4%B1-program%C4%B1.html>. Accessed January 19, 2023.
- Susiloretni KA, Hadi H, Blakstad MM, Smith ER, Shankar AH. Does exclusive breastfeeding relate to the longer duration of breastfeeding? A prospective cohort study. *Midwifery.* 2019;69:163-171. [CrossRef]
- Karaçam Z, Sağlık M. Breastfeeding problems and interventions performed on problems: systematic review based on studies made in Turkey. *Turk Pediatr Ars.* 2018;53(3):134-148. [CrossRef]
- United Nations Children's Fund (UNICEF). *Breastfeeding: Too Few Children Benefit from Recommended Breastfeeding Practices.* Available at: <https://data.unicef.org/topic/nutrition/breastfeeding/>. Accessed 19 January 2023; 2021.
- Hacettepe Üniversitesi. *Nüfus Etütleri Enstitüsü. Türkiye Nüfus ve Sağlık Araştırması İleri Analiz Raporu.* Ankara: Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü; 2018. Available at: http://www.openaccess.hacettepe.edu.tr:8080/xmlui/bitstream/handle/11655/25746/TNSA_2018_ileri_analiz_raporu.pdf?sequence=1&isAlloved=y. Accessed 19 January 2023.
- Sarı E, Akcaboy M, Öztürk S, Çoban G, Şenel S. Breastfeeding education in a newly organized lactation consultation clinic: an evaluation of its effects on the improvement of maternal attitudes to breastfeeding. *Turk Arch Pediatr.* 2022;57(3):290-294. [CrossRef]
- Yalçın SS, Erdal İ, Erat Nergiz M. Emzirme Reklamı ve Toplumda Yüceltilmesi Çalıştay Kurulu. Emzirmenin Reklamı. İçinde: Karabayır N, Çev. *Her Hekimin Anne Sütü ile Beslenme Konusunda Bilmesi Gerekenler.* 1. Baskı. Ankara: Türkiye Klinikleri; 2021;124-130.
- Çaylan N, Yalçın SS. Türkiye'de ve dünya'da emzirmenin durumu: emzirmenin desteklenmesi için öneriler. İçinde: Başkan S, Çev. *Çocuk Beslenmesi.* 1. Baskı. Ankara: Türkiye Klinikleri; 2020:4-11. Available at: <https://www.turkiyeklinikleri.com/article/tr-turkiyed-e-ve-dunyada-emzirmenin-durumu-emzirmenin-desteklenmesi-icin-oneriler-90595.html>. Accessed January 19, 2023.
- He J, Wan L, Yang W, Luo B. Visual analysis of midwifery research in China based on bibliometrics. *J Midwifery Womens Health.* 2022;67(4):478-487. [CrossRef]
- Bogilović S, Černe M. The intellectual structure and outlooks for individual creativity research: a bibliometric analysis for the period 1950-2016. In: Reiter-Palmon R., Kennel V. L., Kaufman J. C., eds. *Individual Creativity in the Workplace.* London: Academic Press; 2018:153-188.
- Bhattacharjee NV, Schaeffer LE, Hay SI. Mapping inequalities in exclusive breastfeeding in low-and middle-income countries, 2000-2018. *Nat Hum Behav.* 2021;5(8):1027-1045. [CrossRef]
- Bhattacharjee NV, Schaeffer LE, Marczak LB, et al. Mapping exclusive breastfeeding in Africa between 2000 and 2017. *Nat Med.* 2019;25(8):1205-1212. [CrossRef]
- Aria M, Cuccurullo C. bibliometrix : an R-tool for comprehensive science mapping analysis. *J Inf.* 2017;11(4):959-975. [CrossRef]
- Wáng YXJ, Arora R, Choi Y, et al. Implications of Web of Science journal impact factor for scientific output evaluation in 16

- institutions and investigators' opinion. *QIMS. Quant Imaging Med Surg*. 2014;4(6):453-461. [CrossRef]
31. van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*. 2010;84(2):523-538. [CrossRef]
 32. Bağış M. Bibliyometrik araştırmalarda kullanılan başlıca analiz teknikleri. İçinde: Öztürk O, Gürler G, eds, *Bir Literatür İncelemesi Aracı Olarak Bibliyometrik Analiz*. Nobel Akademik Yayıncılık; 2021:97-108.
 33. van Eck NJ, Waltman L. Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*. 2017;111(2):1053-1070. [CrossRef]
 34. Lotka AJ. The frequency distribution of scientific productivity. *J Wash Acad Sci*. 1926;16(12):317-323. Available at: <https://www.jstor.org/stable/24529203>.
 35. Tokat MA, Okumuş, H, Dennis CL. Translation and psychometric assessment of the breast-feeding self-efficacy scale—short form among pregnant and postnatal women in Turkey. *Midwifery*. 26(1): 101-108.
 36. Cakmak, H, Kuguoglu S. Comparison of the breastfeeding patterns of mothers who delivered their babies per vagina and via cesarean section: An observational study using the LATCH breastfeeding charting system. *Int. J. Nurs. Stud*. 44(7): 1128-1137.
 37. Şahin H, Yılmaz M, Aykut M, Balci E, Sağiroğlu M, Öztürk A. Risk factors for breastfeeding problems in mothers who presented to two public healthcare centers in Kayseri province. *Turk Arch Pediatr*. 48: 145-151.
 38. Karacam Z. Factors affecting exclusive breastfeeding of healthy babies aged zero to four months: A community--based study of Turkish women. *J Clin Nurs*. 17(3): 341-349.
 39. İnce O, Aktas G, Aktepe N, Aydın A. Evaluation of the factors affecting mothers' breastfeeding self-efficacy and breastfeeding success. *J Dr Behcet Uz Child Hosp*. 7(3).
 40. Ergenekon-Ozelci P, Elmaci N, Ertem M, Saka G. Breastfeeding beliefs and practices among migrant mothers in slums of Diyarbakir, Turkey, 2001. *The European Journal of Public Health*. 16(2): 143-148.
 41. Gerçek E, Sarıkaya Karabudak S, Ardiç Çelik N, Saruhan A. The relationship between breastfeeding self-efficacy and LATCH scores and affecting factors. *J Clin Nurs*. 26(7-8): 994-1004.
 42. Ertem IO, Votto N, Leventhal JM. The timing and predictors of the early termination of breastfeeding. *Pediatrics*. 107(3): 543-548.
 43. Örün E, Yalçın SS, Madendag Y, Üstünyurt-Eras Z, Kutluk S, Yurdakök K. Factors associated with breastfeeding initiation time in a Baby-Friendly Hospital. *Turkish Journal of Pediatrics*. 52(1), 10-16.
 44. Rúbio TRPM, Gulo CASJ. Enhancing academic literature review through relevance recommendation: using bibliometric and text-based features for classification. 11th Iberian Conference on Information Systems and Technologies (CISTI). IEEE; 2016:1-6. Available at: <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7521620>. Accessed January 20, 2023.
 45. World Health Organization, World Health Organisation. Staff, & UNICEF. Global strategy for infant and young child feeding. Available at: <https://www.who.int/publications/i/item/9241562218> Accessed 19 January 2023; 2003. World Health Organization; Geneva.
 46. World Health Organization, United Nations Children's Fund. *The Extension of the 2025 Maternal, Infant and Young Child Nutrition Targets to 2030* (Discussion Paper). Geneva: World Health Organization; 2018. Available at: <https://www.who.int/nutrition/global-target-2025/discussion-paper-extension-targets-2030.pdf>. Accessed February 1, 2020.
 47. Yalçın SS, Berde AS, Yalçın S. Determinants of exclusive breast feeding in sub-Saharan Africa: a multilevel approach. *Paediatr Perinat Epidemiol*. 2016;30(5):439-449. [CrossRef]
 48. Yalçın SS, Demirtaş MS, Yalçın S. Breastfeeding while pregnant: a country-wide population study. *Breastfeed Med*. 2021;16(10):827-834. [CrossRef]
 49. Linde K, Lehnig F, Nagl M, Kersting A. The association between breastfeeding and attachment: a systematic review. *Midwifery*. 2020;81:102592. [CrossRef]