

Bibliometric Exploration of the Global Scientific Output on Breast Pumps

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ABSTRACT

Introduction: Breast pumps represent valuable tools to promote continued breastfeeding.

Aim: Describe the characteristics of the global scientific production of breast pumps indexed in Scopus.

Materials and methods: Descriptive study based on bibliometric methodology. A search equation was created using keywords and logical operators. We found 362 articles in Scopus and selected 292 that met the selection criteria. Visibility, impact, and collaboration indicators were estimated using the SciVal tool.

Results: The University of Western Australia had the most publications, although the University of Toronto (18.6) in Canada had the highest average number of citations per publication. The most productive authors were Geddes Donna Tracy and Lai Ching Tat; however, Meier Paula Primmer had 67% more expected citations than the overall average. National collaboration was present in approximately 50% of the publications. Articles in first-quartile journals are published in higher numbers and with a positive trend from 2013 to 2022. Most of the most productive journals were positioned in the Q1 quartile, of these, the Journal of Human Lactation and Breastfeeding Medicine had the most publications.

Conclusion: Research on breast pumps increased, especially in journals positioned in the first and second quartile. National cooperation is the most frequent, with the United States as one of the countries with the most institutions among the most productive.

Keywords: Breast pump, Breast pumpings, Breastfeeding, Bibliometric analyses.

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INTRODUCTION

Breastfeeding is important for the physical and psychological health of the mother and for the proper development of the infant.^{1,2} Although it is recommended that breastfeeding should be exclusive for the first 6 months and complementary breastfeeding for up to 2 years, there are personal, social, political, and cultural barriers that make it difficult for mothers to adequately breastfeed.^{3,4}

Physical problems of the breast such as mastitis or cracked nipples, as well as the perception of insufficient milk production, poor knowledge about breastfeeding, cultural beliefs present in families, work obstacles and lack of regulation that do not ensure optimal conditions represent important challenges to initiate and continue breastfeeding.⁵⁻⁷

Although this is a complex and increasingly worrying reality, there are now alternatives for expressing breast milk and thus ensuring the duration and duration of breastfeeding.⁸ Manual and electric breast pumps allow stimulation, extraction, and collection of breast milk for later use, this tool has various components and accessories that should allow comfort and friendly use when required by the mother.⁹⁻¹¹ Thus, understanding this new technology is essential for mothers to meet their breastfeeding goals, but also for the health care provider to provide appropriate advice according to each woman's needs.¹²

One review reports that the practice of breast pumping and breast pumps has increased, although it is important to consider that the evidence is limited.¹³ Previous studies report findings from different approaches to this issue. Qi et al.¹⁴ conclude that injuries caused by the use of electric breast pumps can occur in women of any socioeconomic status; on the other hand, another study reported that expressed breast milk feeding is higher in women

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who use pumps, but it should also be noted that support is needed for milk expression and storage.^{15,16}

The promotion of expressed breast milk feeding is a valuable alternative to avoid the abandonment of breastfeeding, especially in critical health circumstances for newborns.^{17,18} The use of breast pumps requires a comprehensive assessment of maternal experiences and perceptions during this stage; therefore, research in this thematic field requires a multidisciplinary perspective to better understand it and propose differentiated improvements according to each context. In this sense, bibliometrics is a tool that makes it possible to evaluate the state and trends of research on a topic based on parameters of visibility, impact, and collaboration, in order to recognize research networks and establish new horizons in the thematic field.¹⁹

This research aims to describe the characteristics of the global scientific production on breast pumps indexed in Scopus.

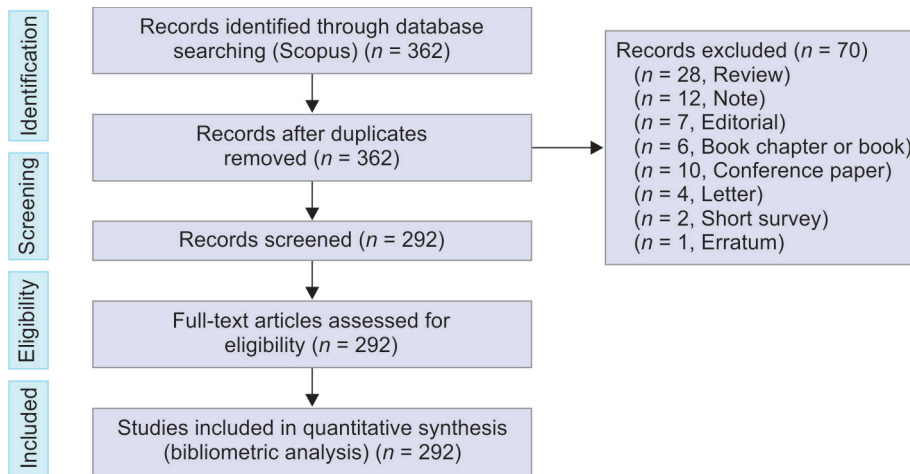


Fig. 1: Flowchart for the selection of scientific publications on breast pumps

Table 1: Top 10 institutions with the most publications in Scopus

Institution	Country	Scholarly output	Citations per publication	FWCI
University of Western Australia	Australia	15	12.5	0.95
University of Toronto	Canada	10	18.6	2.38
Rush University	United States	10	18.4	1.65
University of Pennsylvania	United States	8	10.1	0.95
Russian Ministry of Health	Russian Federation	7	1.7	0.21
St. Petersburg State University	Russian Federation	7	4.6	0.37
The Children's Hospital of Philadelphia	United States	7	11.6	1.09
Complutense University	Spain	6	15.3	0.78
University of Florida	United States	5	28.2	2.21
Medical University of South Carolina	United States	5	25	1.79

FWCI, field-weighted citation impact

MATERIALS AND METHODS

Descriptive and cross-sectional study, conducted with a bibliometric approach to explore articles published in scientific journals indexed in Scopus, from 2013 to 2022, which have addressed the topic of breast pumps.

Before searching for articles, a search equation was developed consisting of MESH terms, the Boolean operator "OR" and the title, abstract and keyword fields. With these characteristics, the search strategy was: TITLE-ABS-KEY ("Breast pump" OR "Breast Pumping" OR "Breast Pumpings" OR "Pumping Breast" OR "Pumpings Breast" OR "Pumpings Breast") AND PUBYEAR > 2012 AND PUBYEAR < 2023. The search was conducted on 03 February 2024 and 362 articles were identified.

The inclusion criteria were articles on breast pumps, published in scientific journals indexed in Scopus, in any language, and disseminated between 2013 and 2022. On the other hand, review articles, notes, books or book chapters, conference papers, editorials, letters, erratum, and short surveys were excluded. 292 scientific publications were analyzed (Fig. 1).

Publication data were exported to the SciVal tool, which allows bibliometric estimates such as a number of publications, citations, citations per published paper, field-weighted citation impact (FWCI), quartile, SCImago Journal Rank (SJR), CiteScore 2022, and

source-normalized impact per paper (SNIP). A trend graph was designed in MS Excel 2019.

As this study was based on secondary analysis of publication metadata, review by a research ethics committee was not required.

RESULTS

Among the institutions with the highest scientific production on breast pumps are five from the United States; however, the University of Western Australia has the most publications; although the University of Toronto (18.6) from Canada and Rush University (18.4) from the United States had the highest average number of citations per publication (Table 1).

The most productive authors were Geddes Donna Tracy and Lai Ching Tat, with 12 publications each; while those with 67% and 59% more expected citations than the overall mean were Meier Paula Primmer and Patel Aloka, respectively. Author Hartmann Peter Edwin is one of those with the highest visibility with an h-index of 50 (Table 2).

National collaboration was present in approximately 50% of the publications. Articles with international collaboration had the highest citation-weighted impact (FWCI: 1.2) and those without collaboration had 25% fewer citations expected according to the global average (Table 3).

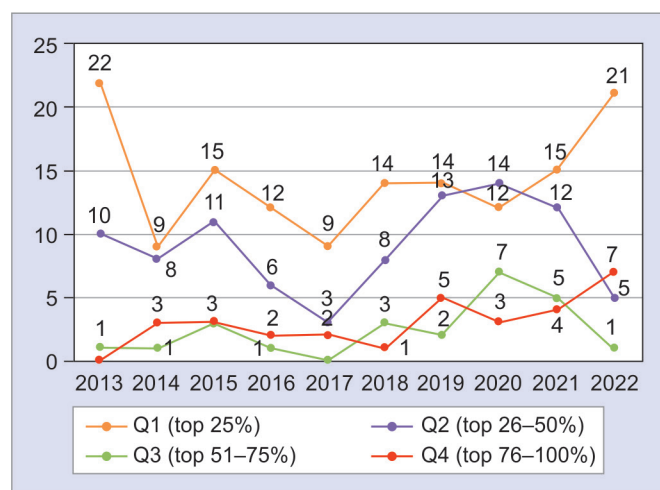
Table 2: Top 10 authors with more publications in Scopus

Name	Scholarly output	Citations	Citations per publication	FWCI	h-index
Geddes, Donna Tracy	12	144	12	0.9	39
Lai, Ching Tat	12	172	14.3	1.02	29
Meier, Paula Primmer	9	177	19.7	1.67	43
Patel, Aloka L	8	97	12.1	1.59	33
Alekseev, Nikolay P	8	34	4.3	0.35	4
Spatz, Diane L	7	81	11.6	1.09	23
Gardner, Hazel	6	36	6	0.23	8
Hartmann, Peter Edwin	5	108	21.6	0.99	50
Amir, Lisa Helen	5	149	29.8	1.62	38
Engstrom, Janet L	5	121	24.2	1.37	30

FWCI, field-weighted citation impact

Table 3: Type of collaboration in Scopus publications

Metric	Scholarly output		Citations	Citations per publication	Field-weighted citation impact
	n	%			
International collaboration	33	11.3%	351	10.6	1.2
Only national collaboration	145	49.7%	2,116	14.6	1.08
Only institutional collaboration	87	29.8%	989	11.4	0.75
No collaboration	27	9.2%	316	11.7	0.77

**Fig. 2:** Trend of the number of publications according to the quartile of scientific journal indexed in Scopus

Articles in first-quartile journals are published in higher numbers and with a positive trend from 2013 to 2022. Scientific journals in the third and fourth quartiles show a slight increase in the number of articles in the study period, whereas, a decrease in articles in Q2 quartile journals is evident from 2020 to 2022 (Fig. 2).

Most of the most productive journals were positioned in the Q1 quartile, of these, the Journal of Human Lactation and Breastfeeding Medicine, both from the United States, had the most publications. The journal with the highest impact normalized by paper was the International Breastfeeding Journal (SNIP: 1.715) and the highest SCImago Journal Rank was Maternal and Child Nutrition (SJR: 1.093) (Table 4).

DISCUSSION

Breastfeeding is the main intervention to achieve maternal and neonatal well-being; however, the reasons why a mother does not initiate or continue with this practice are complex and different in each context.²⁰ In this scenario, breast pumps have positioned themselves as an important alternative to improve the administration of breast milk to the infant and, from this, to generate interest in the development of research that explores various aspects of this tool, especially in special situations in which breastfeeding may be affected, such as mental health problems associated with a positive diagnosis of COVID.^{21,22}

This study demonstrates the growing interest in research on aspects of breastfeeding, such as breast pumps, as well as the increased visibility they have gained through publication in high-impact scientific journals. The field of breastfeeding is recognized as an important one with a great projection towards future research frontiers, which has been previously explored under a bibliometric approach in other studies.^{23,24} In fact, a bibliometric analysis of the scientific literature from Turkey showed that the scientific journals Breastfeeding Medicine and Journal of Human Lactation had the highest productivity.²³ In accordance with these findings, this research also positioned both journals as the leading journals in the field of breast pumps.

Inter-institutional and international cooperation is essential to promote scientific activity, as well as the development and strengthening of collaborative networks to improve skills, access to funding, better outcomes, and academic and personal benefits.²⁵ According to Sabancı Baransel et al.²⁶ in their bibliometric study of breastfeeding, the United States is the main center of an international collaborative network and the leader in scientific production in this field. In this context, what the present research demonstrates is that US academic and health institutions, such

Table 4: Top 10 scientific journals with the most publications in Scopus

Scopus source	Scholarly output	Citations per publication	SNIP	CiteScore 2022	SJR	Quartile	Country
Journal of Human Lactation	38	19.1	1.479	4.9	0.865	Q1	United States
Breastfeeding Medicine	38	16.4	1.004	3.6	0.873	Q1	United States
JOGNN – Journal of Obstetric, Gynecologic, and Neonatal Nursing	13	8.7	0.778	2.8	0.495	Q1	United Kingdom
International Breastfeeding Journal	10	9.9	1.715	5.2	0.990	Q1	United Kingdom
BMC Pregnancy and Childbirth	8	24.1	1.523	4.6	1.034	Q1	United Kingdom
Maternal and Child Nutrition	8	16.6	1.369	6.6	1.093	Q1	United Kingdom
Clinical Lactation	8	0.4	0.082	0.5	0.168	Q3	United States
MCN The American Journal of Maternal Child Nursing	5	23.4	1.039	2.1	0.427	Q1	United States
Journal of Perinatology	4	31.8	1.323	4.7	0.980	Q1	United Kingdom
PLoS ONE	4	16.8	1.253	6	0.885	Q1	United States

SJR, SCImago journal rank; SNIP, source-normalized impact per paper

as Rush University, the University of Pennsylvania, The Children's Hospital of Philadelphia, the University of Florida, and the Medical University of South Carolina, are ranked among the top 10 most productive.

The estimates presented can be very useful for research teams in higher education training institutions, as well as in health establishments, given that this can favor the development of studies that are oriented towards important aspects such as the stage at which the breast pump is introduced, the level of dependence that the mother has on this tool and its capacity to imitate the baby's labor during breastfeeding.^{27,28} With the advancement of technology, new extractor designs are being developed and this creates opportunities to promote research, mainly by health teams.

This study had limitations that are described below: the exploration of scientific activity on the subject was only carried out in Scopus, although this is one of the most important and influential at a global level; in addition, it should be considered that there may be errors in the metadata of the exported articles; on the other hand, self-citations received were not excluded for the analysis, which may affect the estimation of some bibliometric parameters.

CONCLUSION

In conclusion, the current state of research related to breast pumps is increasing, with a preference for dissemination in high-impact scientific journals. United States institutions actively participate in scientific production and are positioned as the most productive; and, international collaboration represents an opportunity for improvement for authors and institutions around the world.

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