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The Impact Of Breastfeeding Duration On Breast Cancer Risk: A Systematic Review

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ABSTRACT

Breast cancer remains a leading cause of mortality among women worldwide. Breastfeeding has been identified as a potential protective factor against breast cancer risk. This systematic review aims to evaluate the relationship between breastfeeding duration and breast cancer risk based on scientific literature published between 2019 and 2024. A comprehensive literature search was conducted through electronic databases, including PubMed, Scopus, and ScienceDirect, using keywords such as "breastfeeding duration," "breast cancer," and "risk." Eligible studies included observational studies, cohort studies, and meta-analyses that assessed the relationship between breastfeeding duration and breast cancer risk. The analysis revealed that breastfeeding for more than 12 months was consistently associated with a reduced risk of breast cancer, particularly for premenopausal breast cancer. This relationship is believed to be related to the hormonal effects of breastfeeding, which reduce estrogen levels and, in turn, decrease the likelihood of abnormal breast cell proliferation. Additionally, factors such as maternal age at childbirth, parity, hormonal status, and lifestyle also influenced the strength of this association. Some studies reported inconsistent results, particularly in different population groups and study designs, suggesting the potential influence of unaccounted confounding factors. Nonetheless, the majority of studies support the hypothesis that longer breastfeeding duration acts as a protective factor against breast cancer. Further research is required to clarify the biological mechanisms underlying this relationship and account for other potential confounding variables.

Keywords: breast cancer, risk, breastfeeding duration, systematic review

Introduction

Breast cancer is a global health issue and remains the leading cause of cancer-related deaths among women. According to data from the Global Cancer Observatory (GLOBOCAN) in 2020, over 2.3 million new cases of breast cancer were diagnosed worldwide, with mortality reaching nearly 685,000 cases. In both developed and developing countries, breast cancer poses a serious threat to women of reproductive age (Sung et al., 2021) . Most breast cancer research has focused on genetic factors, lifestyle, and treatments. However, in recent decades, increasing attention has been given to preventive factors that can reduce cancer risk, one of which is breastfeeding.

Historically, breastfeeding has been recognized not only for its clear benefits to infants but also as a natural way to provide protection for maternal health, including the reduction of breast cancer risk. The World Health Organization (WHO) and the American Academy of Pediatrics (AAP) recommend exclusive breastfeeding for the first six months of a baby's life, followed by continued breastfeeding for at least two years or more, along with complementary feeding (Carroll, 2022) . This recommendation is based on numerous studies showing that the duration of breastfeeding is associated with various health benefits for both the mother and the child.

Several epidemiological studies have demonstrated a relationship between breastfeeding and reduced breast cancer risk. The biological mechanisms underlying this relationship include the reduction of estrogen levels during breastfeeding, which in turn decreases the risk of hormone-dependent cancer development. Additionally, breastfeeding helps accelerate the involution (shrinkage) of breast tissue after pregnancy, thus reducing the likelihood of cancer cell transformation (Stordal, 2023) . However, despite many studies on breastfeeding and breast cancer, there remain unanswered questions, particularly regarding the optimal duration of breastfeeding needed to significantly reduce cancer risk. The duration of breastfeeding varies across countries and social groups, and factors such as the mother's age at childbirth, parity (number of births), and family history can also influence this relationship (Qiu et al., 2022).

The urgency of conducting a systematic review on the role of breastfeeding duration in reducing breast cancer risk is based on several critical factors. Although the relationship between breastfeeding and reduced breast cancer risk has been documented, consensus on

the optimal duration of breastfeeding and its impact on cancer prevention has yet to be reached. Previous research has provided varying results regarding how long a mother should breastfeed to gain significant protective benefits. Some studies suggest that breastfeeding for the first six months is sufficient to lower cancer risk, while others propose a duration of over one year for maximum protection (Qiu et al., 2022).

These differences in findings can be attributed to various factors, including differences in study methodology, populations studied, and variations in controlled factors such as age, family history, and lifestyle. A systematic review is necessary to analyse and synthesize recent research results to gain a more consistent understanding of the relationship between breastfeeding duration and breast cancer risk. This review is also crucial for providing stronger evidence to health policymakers, enabling them to design more effective and evidence-based prevention programs. Therefore, it is important to consider regional variations in the studies reviewed in this article (Abraham et al., 2023).

A systematic review focusing on the 2019-2024 period will provide more up-to-date data, helping to answer some unresolved questions from previous research, as well as provide a stronger scientific foundation for breastfeeding guidelines. Specifically, this research is also important because breastfeeding is one of the most affordable and accessible interventions for reducing breast cancer risk, potentially making a significant impact on a global scale.

The primary novelty of this research lies in its scope, reviewing studies published within the last five years (2019-2024). This period is important because it encompasses the latest developments in breastfeeding practices as well as more advanced epidemiological research. Newer studies often use more comprehensive data and sophisticated statistical methods to estimate breast cancer risk based on breastfeeding duration. Additionally, this research will consider global changes in breastfeeding policies and promotion driven by international organizations like WHO and UNICEF, and their impact on breastfeeding practices and breast cancer risk.

Another novelty of this research is that it will consider recent advances in breast cancer screening methods over the past few years, which may affect the diagnosis and prevalence of this disease in different populations. For instance, increased access to mammography in some countries may influence breast cancer incidence statistics, making it crucial to assess

whether the reported decrease in breast cancer incidence associated with breastfeeding is also correlated with changes in cancer screening.

This approach includes an in-depth analysis of previous research, new interpretations of the latest epidemiological data, and the global relevance of breastfeeding practices in the context of breast cancer prevention. It will provide an important contribution to the academic literature and health guidelines in the field of cancer prevention. This systematic review aims to evaluate the relationship between breastfeeding duration and breast cancer risk based on scientific literature published between 2019 and 2024.

Research Method

This study employs a systematic review method, which is an approach used to gather, assess, and synthesize scientific evidence from various studies related to breastfeeding duration and breast cancer risk published during the period of 2019-2024. The systematic review aims to obtain a more comprehensive and objective understanding of the relationship between these two variables.

The literature search will be conducted across several major scientific databases such as PubMed, Scopus, Web of Science, and Google Scholar. The inclusion criteria are as follows: studies published between 2019 and 2024; articles discussing the relationship between breastfeeding duration and breast cancer risk; observational studies (cohort, case-control) or meta-analyses; articles available in English or Indonesian; and studies providing relevant data on factors such as maternal age, breastfeeding duration, and breast cancer risk outcomes. The exclusion criteria are as follows: review articles that do not provide empirical data; studies with irrelevant populations (e.g., studies focusing on other risk factors without discussing breastfeeding duration); and studies with poor methodological quality (e.g., inadequate statistical analysis, small sample size).

The data collection process includes a literature search conducted by independent researchers using keywords such as “breastfeeding duration,” “breast cancer risk,” and “2019-2024 systematic review.” The search will cover titles, abstracts, and keywords within each article. Study Selection: After identifying relevant studies, abstracts and full texts will be reviewed to evaluate whether the studies meet the inclusion criteria.

Database	
Scopus	: 341
Pubmed	: 42
Google scholar	: 2330
Web of Science	: 353

The following is the process of literature search activities that have been carried out.

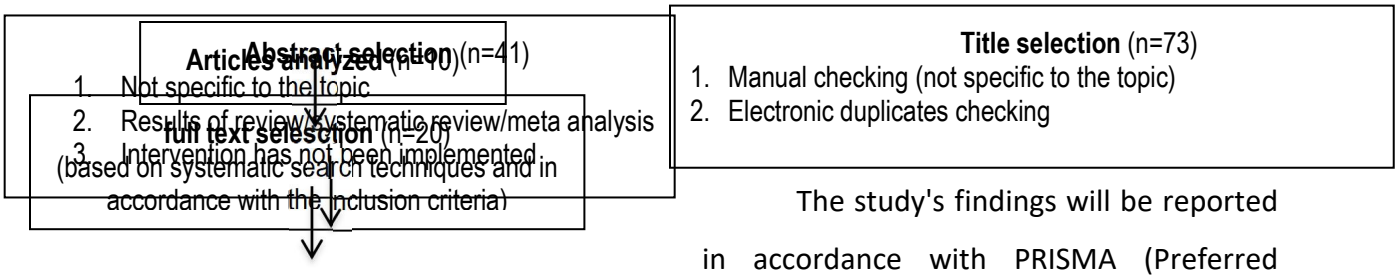

Figure 1. Flow chart literature search process

The quality of the selected studies be assessed using appropriate quality assessment tools, such as the **Newcastle-Ottawa Scale (NOS)** for observational studies (Wells et al., 2012) .

The study's findings will be reported in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, which include a study flow diagram, a table of study characteristics, and detailed reporting of the synthesis and meta-analysis results (Shamseer et al., 2015).

Results and Discussions

A total of 1639 research articles worldwide were found through the scopus, pubmed, google scholar and web of science databases. After screening the title, abstract and selection of article content according to the inclusion criteria, 10 articles were obtained for further analysis. The analysis was carried out through a review of the abstract and also the content of the article as presented in table 1.

Table 1. Systemic Review Matrix

No	Country	Year	Author	Types of research/Method	Result
1	Indonesia	2023	Feriani P., Yunitasari E., and Safaah N	Observational study	Longer duration of breastfeeding is associated with a reduced risk of breast cancer. Women who breastfed for more than 12 months showed a lower risk of breast cancer compared to those who breastfed for a shorter duration or did not breastfeed at all, namely a 58.5% risk of developing breast cancer.
2	India San Salvador, USA	2023	Merin Abraham, Muhammad Ali Lak, Danyel Gurz, Freida Oshin Martinez Nolasco, Preethi Kamala Kondraju, and Javed Iqbal	Narrative review	For women who breastfeed for more than a year, breastfeed- ing for more than a year was associated with a 22-50% reduced risk of breast cancer compared to women who never breastfed (OR=0.55, 95% CI=0.38 to 0.80; P=0.001). The risk reduction was even greater for longer durations of breastfeeding (more than a year).
3	2019	USA Mexico	Meera Sangaramoorthy, et al	Pooled analysis of several large case-control studies	Risk decreased with longer duration of breastfeeding, with a 37% risk reduction for breastfeeding for ≥25 vs. 0 months (OR = 0.73; 95% CI = 0.60, 0.89; Ptrend = 0.03 for women who breastfed), with no

					heterogeneity by menopausal status (Heterogeneity = 0.81).
4	2021	Kenya	Shahin Sayed, Et al	Observational study	Long-term breastfeeding (more than 12 months) was found to be a protective factor against breast cancer in both ER+ and PR+ subtypes (p value 0.003). In contrast, higher parity (number of children born) did not appear to have a significant protective effect against TNBC in this population.
5	2021	Korea	Eunju Jin, Hyunju Kang, dan Mia Son	Prospective cohort design	Women who had ever breastfed were found to have a lower risk of breast cancer compared to those who had never breastfed. This risk reduction was stronger in women who had breastfed for more than 12 cumulative months. These results are consistent with previous studies showing that breastfeeding can reduce exposure to the hormone estrogen which triggers the growth of cancer cells in breast tissue. The prevalence of breast cancer was 1.37 times higher in the non-breastfeeding group than in the breastfeeding group

6	2019	Teheran, Iran	Yaser Mansoori, et al	Comparative study	The main results of this study showed that women who never breastfed or only breastfed for a short period of time had significantly higher expression of lncRNA u-Eleanor in their breast tissue compared to women who breastfed for a longer period of time.
7	2021	Iran	Amir Almasi-Hashiani, Saharnaz Nedjat, Reza Ghiasvand, Saeid Safiri, Maryam Nazemipour, Nasrin Mansournia & Mohammad Ali Mansournia	case-control study design	Increasing the number of children and duration of breastfeeding were found to have protective effects against breast cancer. Each additional birth and longer duration of breastfeeding decreased the risk of breast cancer, consistent with the theory that breastfeeding decreases estrogen exposure. Breastfeeding duration ≤60 months (RR = 1.8, 95% CI = (1.3, 2.5
8	2019	Indonesia	Nurhayati, Zaenal Arifin, dan Handono	Analytical observational study	Having more children was found to reduce the risk of breast cancer, which is consistent with the finding that pregnancy and breastfeeding play a role in reducing exposure to the hormone estrogen. risk of

					breastfeeding status with breast cancer incidence (p-value = 0.000, and OR = 4.97).
9	2019	Moroko	Drissi Houda, Imad Fatima Ezzahra, Bendahhou Karima, Benider Abdelatif, dan Radallah Driss	case-control study design	Having more children has a protective effect on the risk of breast cancer. Pregnancy and breastfeeding reduce exposure to estrogen and, thus, reduce the risk of cancer. Women who breastfed for more than 12 months showed a lower risk of breast cancer compared to those who breastfed for a shorter duration or did not breastfeed at all, namely a 58% risk of developing breast cancer.
10	2020	China	Hanlu Gao, Chao Yangb , Jinqing Fand , Li Lan and Da Pang	case-control study design	Shorter duration of breastfeeding or never breastfeeding is associated with an increased risk of MGH. Women who do not breastfeed or who breastfeed for a short period of time are more likely to experience abnormal growth of breast tissue compared to those who breastfeed for a longer period of time. Shorter duration of breastfeeding (OR 27.70 [95% CI 3.73 to 205.70])

Breast cancer risk factors have been identified ranging from genetics, environment, to lifestyle. One factor is the potential role of breastfeeding in reducing the risk of breast cancer. The duration of breastfeeding has been widely studied in relation to reducing the risk of breast cancer. Several studies support that breastfeeding, especially over a long period of time, has a protective effect against the development of breast cancer.

Breastfeeding can affect the risk of breast cancer through several mechanisms, namely:

1. Reducing Exposure to Estrogen Hormone: Breast cancer is often triggered by estrogen, a hormone that plays a role in the development of breast cells. When women breastfeed, estrogen levels in the body decrease, reducing the exposure of the breast to this hormone. This decrease in estrogen levels helps suppress the risk of cancer cell growth.
2. Breast Epithelial Cells: The breastfeeding process causes the replacement of epithelial cells in the breast, which function to replace cells that may have mutations or DNA damage. Thus, breastfeeding is considered a "cleaning" process of cells that are at risk of becoming cancerous.
3. Ovulation Suppression: Exclusive breastfeeding can delay the return of the menstrual cycle in women, which means a longer anovulatory period. This reduces the number of ovulatory cycles a woman experiences in her lifetime, thus reducing her exposure to the hormone estrogen (Chen et al., 2023)

Scientifically, longer duration of breastfeeding has a greater protective effect against breast cancer through several biological mechanisms related to hormonal, cellular, and metabolic changes in breast tissue. To understand this comprehensively, it is important to look at the pathophysiology underlying the relationship.

1. Decreased Exposure to Estrogen

Estrogen and Breast Cancer: Breast cancer is generally influenced by the hormone estrogen, which can stimulate the proliferation (growth) of cells in the mammary glands, especially epithelial cells. The more often the breast is exposed to estrogen, the greater the risk of cellular mutations that can lead to cancer.

Effect of Breastfeeding: When breastfeeding, estrogen levels in the body decrease significantly. The lactation process hormonally suppresses ovarian function (through the hormone prolactin), which reduces estrogen production. This results in reduced

estrogen exposure in breast tissue. Longer duration of breastfeeding means a longer decrease in estrogen exposure, thereby reducing the risk of epithelial cell transformation into cancer cells (Fortner et al., 2019).

2. Suppression of Ovulation and Estrogen Exposure

Ovulation and Breast Cancer Risk: Each menstrual cycle followed by ovulation causes an increase in estrogen levels, which plays a role in the risk of breast cancer development. The number of menstrual cycles a woman experiences during her lifetime (from menarche to menopause) greatly influences her cumulative estrogen exposure.

Longer Duration of Breastfeeding Delays Ovulation: Exclusive and continued breastfeeding suppresses ovulation (via increased prolactin levels that suppress luteinizing and follicle-stimulating hormones). This delays the return of menstruation and reduces the number of menstrual cycles a woman experiences during her lifetime. A longer delay means a decrease in the number of ovulatory cycles, which in turn decreases estrogen exposure and breast cancer risk (Fortner et al., 2019).

3. Breast Epithelial Cell Proliferation and Turnover

Epithelial Cells in Breast Cancer: Breast cancer often begins in the epithelial cells lining the breast ducts and lobules. These cells are susceptible to genetic mutations that can lead to malignancy.

Breastfeeding and Epithelial Cell Renewal: Breastfeeding causes differentiation and proliferation of breast epithelial cells, which undergo significant turnover after lactation is complete. This turnover may help “clear” out damaged or mutated cells that could potentially become cancerous. The longer a woman breastfeeds, the longer this process lasts, and the more epithelial cells are replaced, reducing the chances of abnormal cells developing into cancer (Fortner et al., 2019).

4. Reduced Inflammatory Response and Growth Factors

Role of Growth Factors and Inflammation: Factors such as insulin-like growth factor (IGF) and pro-inflammatory cytokines are often associated with cancer cell proliferation. Chronic inflammatory responses in breast tissue can cause oxidative stress that contributes to DNA mutations and tumorigenesis.

Longer Duration of Breastfeeding Reduces Risk of Inflammation: Breastfeeding has been associated with a decreased inflammatory response in breast tissue. In

studies, women who breastfeed have a lower profile of growth factors, which play a role in tumor formation. Breastfeeding for a longer duration provides more time to reduce the potential for chronic inflammation in breast tissue (Fortner et al., 2019).

5. Influence of Immunological Factors and Other Hormones

Prolactin and Immunological Effects: In addition to stimulating milk production, prolactin also has immunomodulatory effects that can support breast tissue health. High levels of prolactin during breastfeeding help promote cell differentiation, which reduces the risk of cancer formation.

Effects of Melatonin: Breastfeeding, especially at night, increases the production of melatonin, which is known to have anti-cancer properties through free radical reduction and DNA repair. The longer the duration of breastfeeding, the greater this protective effect (Fortner et al., 2019).

6. Changes in Breast Architecture

Anatomical Changes in Breasts after Lactation: Longer duration of breastfeeding causes significant changes in the structure and composition of breast tissue. Lobular and ductal cells undergo more mature differentiation, and after breastfeeding stops, lobules regress. This process is believed to reduce the risk of cancer development because there is a period of "remodeling" that renews the tissue.

Decreased Adipocytes and Leptin: Lactating breasts have fewer adipocytes (fat cells), which are physiologically more likely to produce the hormone leptin. Leptin may increase the risk of cancer through its effects on cell proliferation and tumor angiogenesis. Longer duration of breastfeeding reduces the proportion of adipocytes, thereby decreasing leptin production and breast cancer risk (Fortner et al., 2019).

The review article showed that longer duration of breastfeeding is associated with a lower risk of breast cancer, especially in women who use hormonal contraception. Breastfeeding reduces exposure to the hormone estrogen, which plays a major role in the development of breast cancer. Women who breastfeed for more than 12 months showed a significantly lower risk of breast cancer compared to those who breastfeed for a shorter duration or do not breastfeed at all (Feriani et al., 2023) . In a narrative review by Abraham et al., breastfeeding was considered one of the strongest protective factors against breast cancer. This study reviewed studies that showed that breastfeeding for more than 12 months can reduce the risk of breast cancer by up to 30%. This protective effect is attributed to

the reduction in menstrual cycles and the decrease in estrogen levels during breastfeeding. Breastfeeding also facilitates the shedding of epithelial cells in the breast, which may prevent the accumulation of abnormal cells that have the potential to become cancerous (Abraham et al., 2023).

The study by Sangaramoorthy et al. focused on Hispanic women who had given birth, confirmed that longer duration of breastfeeding provides protection against breast cancer, especially in hormone receptor-positive cancers. The study showed that breastfeeding for more than 12 months can reduce the risk of breast cancer by 20-30%, especially in women with estrogen and progesterone receptor-positive cancers. The proposed mechanism of protection is reduced exposure to estrogen hormones that stimulate breast cancer cell growth (Sangaramoorthy et al., 2019) . Maurya and Brahmachari in their systematic review of Indian women found that longer breastfeeding was consistently associated with a reduced risk of breast cancer. Interestingly, the study highlighted that women in India who had a long-term breastfeeding practice (more than 12 months) showed a greater reduction in risk, possibly due to cultural factors that encourage long-term breastfeeding. Hormonal factors, including breastfeeding, strongly influence the development of breast cancer in this population (Maurya & Brahmachari, 2023).

A study by Sayed et al. revealed that the duration of breastfeeding affects the risk of breast cancer depending on the molecular subtype. In Kenya, breastfeeding for more than 12 months was associated with a reduced risk of several subtypes of breast cancer. Triple-negative cancer, which is difficult to treat, was less common in women who had a long duration of breastfeeding. This suggests that breastfeeding may act as a protective factor not only against hormone-dependent cancers but also against more aggressive subtypes (Sayed et al., 2021) . A study by Gao et al. examined the association between heredity and duration of breastfeeding with the development of mammary gland hyperplasia, a condition considered a risk factor for breast cancer. The study found that women with a family history of breast cancer were more susceptible to mammary gland hyperplasia, but that longer breastfeeding may reduce this risk. Breastfeeding helps reduce exposure to excess estrogen, which can trigger abnormal growth in breast tissue. A study by Jin et al. found that longer breastfeeding was also associated with a reduced risk of thyroid and cervical cancers, in addition to breast cancer. This reduced risk was

particularly pronounced in women who breastfed for more than 12 months. This suggests that the protective effect of breastfeeding may extend beyond (Gao et al., 2021).

Conclusion

From the studies discussed, there is strong evidence that breastfeeding, especially for longer durations (more than 12 months), consistently reduces the risk of breast cancer. This protective effect is related to decreased exposure to estrogen hormones, shedding of breast epithelial cells, and more favorable genetic changes. Breastfeeding also appears to provide protection against other types of hormone-dependent cancers, such as thyroid and cervical cancers. Therefore, the promotion of breastfeeding as a cancer prevention measure should be an important part of public health policy to reduce the burden of breast cancer in various populations.

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Conflic of Interest

The author(s) declare that they have no conflict of interest.

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