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BREASTFEEDING IN THE PREVENTION OF BREAST CANCER

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ABSTRACT

This study addressed breastfeeding as a protective factor in the prevention of breast cancer, highlighting the biological, physiological, and epidemiological mechanisms that support this relationship. The main objective was to analyze, in light of scientific literature, how breastfeeding contributes to reducing the risk of developing breast cancer, understanding its hormonal and cellular bases and its impact on public health. The research was bibliographic and qualitative in nature, grounded in national and international studies from organizations such as the World Health Organization (WHO), the National Cancer Institute (INCA), and scientific articles indexed in recognized databases. Evidence reviewed demonstrated that breastfeeding significantly reduces the risk of breast cancer, particularly in women who breastfed for prolonged periods, due to decreased exposure to estrogen, suppression of the ovulatory cycle, and induction of apoptosis and cellular renewal processes in the mammary gland. The investigation also revealed that breast physiology during lactation involves hormonal and structural changes that promote not only milk production but also protective cellular differentiation and tissue balance. Results showed that breastfeeding is essential not only for the healthy development of the child but also as an effective measure for breast cancer prevention, with long-lasting benefits for women's health. It was found that each additional cumulative breastfeeding period represented a percentage reduction in breast cancer risk, reinforcing the dose-response nature of this protection. The study concluded that encouraging and supporting breastfeeding is a low-cost, high-impact public health strategy with the potential to reduce female morbidity and mortality and promote physical, emotional, and social well-being. Thus, the research reaffirmed the importance of integrating public policies aimed at promoting breastfeeding and raising awareness of its preventive benefits for both mothers and society.

Keywords: Breastfeeding; Breast cancer; Prevention; Women's health; Maternal lactation.

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INTRODUCTION

Breastfeeding is a biological, social, and cultural phenomenon that plays a fundamental role in maternal and child health and in the prevention of various diseases throughout life. In addition to ensuring optimal nutrition and healthy development of the newborn, breastfeeding has been widely recognized for its protective effects on women's health, particularly in reducing the risk of developing breast cancer. Contemporary scientific literature, represented by studies from the World Health Organization (WHO, 2020), the National Cancer Institute (INCA, 2023), and authors such as Victora et al. (2016) and Silva et al. (2018), emphasizes that exclusive breastfeeding until six months of age and continued breastfeeding up to two years or beyond is associated not only with improved child health indicators but also with the prevention of chronic and neoplastic diseases in mothers.

Breast cancer, in turn, is the most common malignant neoplasm among women worldwide, representing a major public health problem due to its high mortality rate and psychosocial impact. According to INCA (2023), it is estimated that more than 70,000 new cases are diagnosed annually in Brazil, highlighting the need for effective preventive strategies. In this context, understanding the relationship between breastfeeding and breast cancer prevention is essential for strengthening public health policies and expanding scientific knowledge about the physiological and hormonal mechanisms that explain this association.

The general objective of this study was to analyze scientific evidence linking breastfeeding to reduced breast cancer risk, highlighting the physiological, biological, and epidemiological aspects that support this relationship. Specifically, it sought to understand hormonal and tissue changes occurring in the breast during lactation, identify biological mechanisms of protection conferred by breastfeeding, and discuss study results indicating risk reduction according to breastfeeding duration.

The central hypothesis of this work was based on the premise that breastfeeding exerts a protective effect on breast tissue, as it promotes cellular differentiation, hormonal regulation, and reduced exposure to estrogen—factors recognized for lowering carcinogenic potential. Furthermore, it is assumed that prolonged breastfeeding is associated with cumulative protection, reinforcing its importance as a primary prevention strategy for breast cancer.

The justification for conducting this research lies in the social and scientific relevance of the topic, considering that breastfeeding is a natural, low-cost practice with significant impact on women's health. Promoting breastfeeding, therefore, not only strengthens the mother-child bond but also represents a preventive measure against serious diseases, contributing to reduced female mortality and advancing public health policies.

Methodologically, the study was developed through a qualitative bibliographic review based on the analysis of books, scientific articles, systematic reviews, reports from international organizations,

and official documents from the Ministry of Health and the World Health Organization. Information was selected and organized into thematic axes addressing, respectively, the concept and importance of breastfeeding, general aspects of breast cancer, breast physiology during lactation, biological mechanisms of protection, and scientific evidence on the relationship between breastfeeding and breast cancer prevention.

Ultimately, the research demonstrated that breastfeeding is essential for the comprehensive health of women and children, representing a powerful tool for prevention and health promotion. Thus, the study reaffirmed the importance of encouraging breastfeeding as a public policy and as an individual behavior for protecting life and women's health.

METHODOLOGY

This study was characterized as a bibliographic and qualitative research focused on analyzing scientific evidence linking breastfeeding to breast cancer prevention. The investigation was based on books, scientific articles, reports, and official documents from institutions such as the Ministry of Health, INCA, WHO, and UNICEF, as well as publications available in databases such as SciELO, PubMed, Google Scholar, and LILACS. Priority was given to studies published between 2016 and 2023, complemented by classic references on the subject.

Inclusion criteria encompassed works addressing the benefits of breastfeeding for women's health, physiological and hormonal mechanisms of lactation, and the relationship between breastfeeding and breast cancer. Publications lacking scientific basis were excluded. Material was analyzed through selective reading and critical interpretation, organized into thematic axes corresponding to the sections of the study.

As this was a theoretical study, there was no involvement of human subjects, thus exempting ethical review. This methodology enabled the construction of an integrated and well-founded perspective on the importance of breastfeeding as a natural and effective strategy for promoting women's health and preventing breast cancer.

DEVELOPMENT

CONCEPT AND IMPORTANCE OF BREASTFEEDING

Breastfeeding is a fundamental biological and social process that involves feeding the newborn with breast milk directly from the mother's breast. According to the World Health Organization (WHO, 2020), breastfeeding is the most natural and effective way to ensure nutrition, growth, and healthy development of the child, being recommended exclusively for the first six months of life and, complementarily, up to two years or beyond. This practice transcends the simple act of feeding,

constituting a moment of emotional bonding, security, and interaction between mother and child, essential for the baby's physical and emotional development (BRASIL, 2021).

The definition of breastfeeding, according to UNICEF (2021), encompasses any practice in which breast milk is offered to the child, whether directly at the breast or expressed, emphasizing that exclusive breastfeeding occurs when the child receives only the mother's milk, without other liquids or foods. Breast milk is a complete food, containing proteins, fats, vitamins, minerals, and antibodies in ideal proportions to meet the baby's needs (SILVA et al., 2018). Furthermore, it has immunological and anti-inflammatory properties that protect the child against respiratory infections, diarrhea, allergies, and various chronic non-communicable diseases (VICTORA et al., 2016).

The benefits of breastfeeding are not limited to the baby. For the mother, breastfeeding contributes to postpartum uterine recovery, reduces the risk of hemorrhage, and favors a faster return to pre-pregnancy weight (BRASIL, 2021). Studies also indicate that the practice is associated with a lower incidence of breast and ovarian cancer, as well as a reduced risk of developing type 2 diabetes and cardiovascular diseases (VICTORA et al., 2016; LIMA; GOMES, 2020). For the baby, benefits include better cognitive and emotional development, strengthening of the immune system, and reduced infant mortality (WHO, 2020).

From a social and economic perspective, breastfeeding also brings significant benefits. By reducing the need for artificial formulas and hospitalizations for preventable diseases, it contributes to saving public and private health resources (ROLLINS et al., 2016). Thus, breastfeeding is an investment in health and sustainable human development, positively impacting indicators of mortality, nutrition, and quality of life (SILVA et al., 2018).

The relevance of breastfeeding for public health is widely recognized. The Ministry of Health (BRASIL, 2021) considers breastfeeding one of the pillars of child health promotion policies due to its potential to prevent diseases and strengthen family bonds. The practice is regarded as a low-cost, high-impact intervention capable of significantly reducing neonatal and infant mortality. WHO (2020) estimates that increasing exclusive breastfeeding rates up to six months could save more than 800,000 infant lives annually worldwide.

In this sense, encouraging and protecting breastfeeding is a collective responsibility involving effective public policies, adequate professional support, and social awareness. Campaigns and programs aimed at promoting breastfeeding, such as the Baby-Friendly Hospital Initiative (BFHI), have proven effective in increasing breastfeeding rates and creating supportive environments for mothers (UNICEF, 2021). Thus, breastfeeding is not merely an individual act but a social and public health practice that directly reflects on population well-being and the construction of a healthier and more supportive society.

BREAST CANCER: GENERAL ASPECTS

Breast cancer is one of the most studied and discussed diseases in public health due to its high incidence and social and emotional impact on women's lives. According to the National Cancer Institute (INCA, 2023), breast cancer is characterized by the uncontrolled multiplication of abnormal cells in the breast, forming a tumor with the potential to invade adjacent tissues and spread to other parts of the body (metastasis). It is the most common type of cancer among women worldwide and the leading cause of cancer-related death in this population, representing a major challenge for health systems (WHO, 2022).

There are several types of breast cancer, classified according to their cellular origin and clinical behavior. The most frequent are ductal and lobular carcinomas, originating respectively in the lactiferous ducts and mammary lobules (BRASIL, 2023). Invasive ductal carcinoma accounts for about 80% of cases and is known for its ability to invade surrounding breast tissue and eventually reach other organs (SOUZA; PEREIRA, 2021). Invasive lobular carcinoma is less common but tends to present multiple foci in the breast and sometimes in both breasts. Additionally, there are in situ carcinomas, considered precursor lesions that have not yet invaded neighboring tissues and can be detected early through screening exams such as mammography (INCA, 2023).

Risk factors for breast cancer are varied and include genetic, hormonal, behavioral, and environmental components. Among genetic factors, mutations in the BRCA1 and BRCA2 genes stand out, conferring a higher predisposition to the disease and often associated with familial cases (THOMAS; WATSON, 2020). In the hormonal field, prolonged exposure to estrogen—whether due to early menarche, late menopause, nulliparity, or long-term use of hormonal therapies—increases the risk of tumor development (SILVA; LOPES, 2019). From an environmental and behavioral perspective, factors such as physical inactivity, excessive alcohol consumption, obesity, smoking, and diets rich in saturated fats have been widely associated with the disease (WHO, 2022).

Other important aspects include aging, as breast cancer risk increases with age, and exposure to ionizing radiation, especially in women who underwent chest radiotherapy at a young age (BRASIL, 2023). Although some risk factors are non-modifiable, such as genetic inheritance, many are related to lifestyle and can be prevented through health promotion actions, preventive education, and early screening (SOUZA; PEREIRA, 2021).

The incidence of breast cancer has been rising in recent decades, particularly in developing countries, due to urbanization, lifestyle changes, and increased life expectancy. According to WHO (2022), more than 2.3 million new cases are diagnosed annually worldwide, representing about 11.7% of all new cancer cases. In Brazil, INCA (2023) projects more than 70,000 new cases per year for the 2023–2025 period, with an estimated risk of 66.5 cases per 100,000 women.

The impact of breast cancer on the female population is profound and multifaceted. In addition to physical and psychological repercussions, the diagnosis significantly affects women's social, professional, and family lives. Treatment may involve surgery, radiotherapy, chemotherapy, and hormone therapy—procedures that require emotional support and multidisciplinary follow-up (SILVA; LOPES, 2019). Coping with the disease is also related to self-esteem and female identity, as the breast holds symbolic value linked to motherhood and femininity (THOMAS; WATSON, 2020).

From a public health perspective, breast cancer represents a major global problem. Early detection and expanded access to preventive exams, such as mammography, are fundamental strategies to reduce mortality and improve prognosis (BRASIL, 2023). Programs such as Pink October have played a relevant role in raising awareness and encouraging regular exams, as well as promoting debate on the importance of early diagnosis and appropriate treatment. Thus, understanding the general aspects of breast cancer is essential for formulating effective public policies and strengthening comprehensive women's health care.

BREAST PHYSIOLOGY DURING LACTATION

The physiology of the breast during lactation is a complex and dynamic process involving a series of hormonal, cellular, and tissue changes coordinated to enable the production and ejection of breast milk. From the onset of pregnancy to the post-weaning period, the breast undergoes profound structural and functional modifications that ensure not only the newborn's nutrition but also play a protective role in women's health (NEVES; ALMEIDA, 2020). Lactation is, therefore, a fundamental physiological phenomenon resulting from the integration between the endocrine system and mammary tissue, under the direct influence of hormones such as prolactin, oxytocin, estrogen, and progesterone (GUERRA; FREITAS, 2019).

During pregnancy and lactation, the woman's body experiences significant hormonal changes. Prolactin, produced by the anterior pituitary gland, is the main hormone responsible for milk synthesis and secretion. Its release increases significantly after childbirth, when estrogen and progesterone levels drop—hormones that, during pregnancy, inhibit prolactin's action on mammary alveoli (SILVA et al., 2018). Oxytocin, secreted by the neurohypophysis, promotes the contraction of myoepithelial cells surrounding the alveoli and mammary ducts, enabling milk ejection, a phenomenon known as the "let-down reflex" (BRASIL, 2021). Additionally, hormones such as cortisol, insulin, and growth hormone also participate in regulating lactogenesis, ensuring the metabolic balance necessary for adequate milk production (GUERRA; FREITAS, 2019).

Cellular and tissue modifications occurring in the breast during and after breastfeeding are equally significant. During pregnancy, under hormonal influence, there is intense proliferation of

lactiferous ducts and differentiation of secretory alveoli, which become the main functional component of the mammary gland (NEVES; ALMEIDA, 2020). At the onset of lactation, alveolar epithelial cells specialize in synthesizing milk components such as proteins, lipids, and lactose. This process is accompanied by increased vascularization and lymphatic flow, ensuring the supply of nutrients necessary for milk secretion (SILVA et al., 2018).

After breastfeeding ends, mammary involution occurs, characterized by apoptosis (programmed cell death) of secretory epithelial cells and reabsorption of milk components, leading to partial regression of alveolar structures (BRASIL, 2021). This process is mediated by hormonal and immunological signals that restore mammary tissue to its pre-pregnancy state, although studies indicate that some cellular modifications persist, conferring long-term protective effects against neoplasia development (GONÇALVES; SANTOS, 2022).

The cellular differentiation process occurring during breastfeeding plays a fundamental role not only in secretory function but also in breast protection. Complete maturation of mammary epithelial cells induced by lactation promotes the expression of genes related to genomic stability and mutation suppression, reducing the risk of malignant transformation (THOMAS; WATSON, 2020). Furthermore, controlled apoptosis of cells after weaning prevents the accumulation of damaged cells, contributing to tissue renewal and maintenance of gland integrity (GONÇALVES; SANTOS, 2022). Research suggests that women who breastfeed for prolonged periods have a lower incidence of breast cancer, precisely due to the protective effect associated with differentiation and efficient cell elimination (VICTORA et al., 2016).

Thus, breast physiology during lactation reveals the complex interaction between the endocrine system, mammary tissue, and maternal metabolism. Lactation is not limited to milk production but represents an integrated physiological process that provides simultaneous benefits to mother and child. Hormonal balance, cellular adaptations, and the protective role of tissue differentiation reinforce the importance of breastfeeding as a biological function essential to health and disease prevention (NEVES; ALMEIDA, 2020; BRASIL, 2021).

BIOLOGICAL MECHANISMS OF PROTECTION CONFERRED BY BREASTFEEDING

The biological mechanisms that explain the protection conferred by breastfeeding to female breast health are related to a set of hormonal, cellular, and metabolic processes that reduce the breast's exposure to proliferative stimuli and promote a physiological environment of lower risk for neoplasia development. Several studies indicate that breastfeeding plays a significant protective role against breast cancer, mainly by modulating hormonal activity, inducing cellular differentiation of mammary glands,

and reducing cumulative exposure to estrogen throughout a woman's reproductive life (VICTORA et al., 2016; THOMAS; WATSON, 2020).

One of the central mechanisms of this protection is the reduction of exposure to female hormones, especially estrogen. During breastfeeding, lactation suppresses ovulation through inhibition of the hypothalamic-pituitary-ovarian axis, resulting in low circulating levels of gonadotropins and, consequently, estrogen (GUERRA; FREITAS, 2019). When present in high concentrations for prolonged periods, this hormone stimulates the proliferation of mammary epithelial cells, increasing the risk of mutations and malignant transformation (SILVA; LOPES, 2019). Thus, by reducing estrogen exposure, breastfeeding limits the number of menstrual cycles and, therefore, the total time of hormonal influence on breast tissue (WHO, 2022).

In addition to hormonal modulation, breastfeeding profoundly influences apoptosis and cellular renewal mechanisms in the breast. During lactation, alveolar epithelial cells are highly differentiated and metabolically active, dedicated to milk production and secretion. After weaning, a physiological involution process occurs, characterized by apoptosis of secretory cells and reabsorption of milk components (GONÇALVES; SANTOS, 2022). This programmed cell death process is essential because it eliminates potentially damaged cells or those with genetic alterations accumulated during the lactation cycle. Furthermore, involution stimulates mammary tissue remodeling, restoring its structure and functionality, which contributes to maintaining tissue homeostasis and reducing the risk of neoplastic transformation (NEVES; ALMEIDA, 2020).

Controlled cellular renewal during and after lactation also promotes efficient regeneration of mammary epithelium. This mechanism is associated with the activation of genetic pathways related to tumor suppression and DNA stability, conferring greater resistance to mutagenic processes (THOMAS; WATSON, 2020). Thus, breastfeeding not only exerts an immediate protective effect but also induces lasting epigenetic modifications that keep mammary tissue in a state less susceptible to carcinogenesis.

Another relevant aspect is the reduction in the number of ovulatory cycles, which directly impacts the decreased risk of breast cancer. Women who breastfeed for prolonged periods experience long intervals of lactational amenorrhea, during which ovarian hormone production is naturally suppressed (VICTORA et al., 2016). This phenomenon reduces cumulative exposure of mammary tissue to estrogen and progesterone—hormones with mitogenic effects—thereby lowering the probability of genetic events responsible for tumor initiation (SILVA; LOPES, 2019). Population studies show that each 12 months of breastfeeding reduces breast cancer risk by approximately 4.3%, regardless of parity or age (WHO, 2022).

Additionally, breastfeeding promotes a distinct metabolic state characterized by mobilization of lipid reserves accumulated during pregnancy and reduction of insulin levels and growth factors such as

IGF-1 (Insulin-like Growth Factor 1), which are associated with cell proliferation and carcinogenesis (GUERRA; FREITAS, 2019). Thus, breastfeeding also contributes to metabolic and hormonal balance, reinforcing the set of biological mechanisms that decrease susceptibility to breast cancer.

In summary, the protection conferred by breastfeeding results from the integration of hormonal, cellular, and metabolic factors that collectively reduce breast tissue exposure to proliferative stimuli, promote the elimination of potentially mutated cells, and stabilize the tissue environment. Therefore, breastfeeding should be recognized not only as a practice of infant nutrition but also as a natural and effective prevention strategy against breast cancer, with long-lasting benefits for women's health (VICTORA et al., 2016; GONÇALVES; SANTOS, 2022).

CONCLUSION

This study concluded that breastfeeding is an essential process not only for the healthy development of the baby but also for the promotion and preservation of women's health, acting as an important protective factor against breast cancer. The analysis of scientific and physiological evidence demonstrated that breastfeeding significantly influences the reduction of breast neoplasia risk due to the interaction of hormonal, cellular, and metabolic mechanisms that promote tissue balance and reduce breast tissue exposure to proliferative stimuli.

It was found that prolonged breastfeeding reduces women's exposure to estrogen—a hormone directly associated with cellular proliferation and breast carcinogenesis. Furthermore, breastfeeding induces cellular differentiation of mammary glands and favors apoptosis and tissue renewal processes, eliminating potentially mutated cells and decreasing the chances of malignant transformation. These mechanisms, combined with the reduction in the number of ovulatory cycles during lactation, biologically explain the protective effect observed in various epidemiological studies and meta-analyses.

The analyzed research highlighted a direct relationship between breastfeeding duration and decreased breast cancer risk, confirming a dose-dependent response pattern: the longer the breastfeeding period, the greater the protection conferred. This finding reinforces the importance of encouraging prolonged breastfeeding for both child well-being and women's health.

The study also emphasized that, beyond its individual benefits, breastfeeding represents an effective public health strategy that is low-cost and high-impact. By preventing diseases and reducing maternal and infant mortality, breastfeeding contributes to the sustainability of health systems and to achieving global health and well-being goals.

Therefore, promoting breastfeeding should be a priority in public health policies, requiring strengthened educational campaigns, institutional support for lactating women, and training of health professionals to provide adequate assistance to mothers. Encouraging breastfeeding is an investment in

prevention, quality of life, and reduction of chronic diseases, consolidating it as a vital practice for women's health and sustainable human development.

Thus, breastfeeding is reaffirmed as an act of love, care, and, above all, protection of life, whose positive effects extend beyond childhood and throughout a woman's life, constituting a powerful ally in the fight against breast cancer.

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