OPEN ACCESS

**Saudi Journal of Medical and Pharmaceutical Sciences**
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

**Review Article** **Obstetrics & Gynecology**

# Impact of Breastfeeding duration on the Risk of Ovarian Cancer: Systematic Review

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**DOI:** https://doi.org/10.36348/sjmps.2026.v12i04.006 | **Received:** 19.02.2026 | **Accepted:** 13.04.2026 | **Published:** 18.04.2026

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## Abstract

***Background*:** Ovarian cancer is a highly lethal gynaecological malignancy with over 240,000 new cases and 190,000 deaths annually worldwide. Breastfeeding has been proposed as a protective factor through ovulation suppression and hormonal modulation, but the specific impact of breastfeeding duration on ovarian cancer risk requires updated synthesis of recent evidence. ***Objective*:** To systematically review and synthesise evidence from the last five years on the association between breastfeeding duration and the risk of ovarian cancer. ***Methods*:** A systematic review was conducted following PRISMA 2020 guidelines. PubMed/MEDLINE and Scopus were searched from January 2021 to January 2026 for studies reporting quantitative measures of association (hazard ratios, odds ratios, relative risks) between breastfeeding duration and ovarian cancer incidence. Two independent reviewers performed screening using Rayyan. Risk of bias was assessed using the ROBINS-I tool. Due to potential sample overlap, a narrative synthesis was performed. ***Results*:** Of 137 records screened, two large nationwide Korean cohort studies met inclusion criteria, encompassing 2,285,774 women (Kim JH *et al.,* 2026) and 3,754,906 postmenopausal women (Kim LY *et al.,* 2026). Both studies defined prolonged breastfeeding as ≥12 months. Kim JH *et al.,* reported a significant risk reduction among premenopausal women (hazard ratio 0.86, 95% confidence interval 0.77–0.96), while no significant association was observed in postmenopausal women within that study. Kim LY *et al.,* stated a reduced risk for postmenopausal women with ≥12 months of breastfeeding, though the exact hazard ratio was not provided in the abstract. Risk of bias was moderate for both studies, primarily due to potential residual confounding and recall bias. ***Conclusions*:** Breastfeeding for 12 months or longer is associated with a clinically meaningful reduction in ovarian cancer risk, particularly among premenopausal women. These findings support breastfeeding promotion as a low-cost, effective primary prevention strategy. Future research should include diverse populations and detailed duration categories to refine dose-response estimates.

**Keywords:** Breastfeeding; lactation duration; ovarian cancer; ovarian neoplasms; systematic review; risk reduction; reproductive factors.



## INTRODUCTION

Ovarian cancer remains one of the most lethal gynaecological malignancies worldwide, accounting for approximately 240,000 new cases and 190,000 deaths annually, making it the eighth most common cancer in women and the seventh leading cause of cancer death among females [1]. The lifetime risk of developing ovarian cancer is approximately 1.3% in high-income countries, but this figure rises to 1.8% among women with a family history or genetic predisposition [2]. The high case-fatality rate, with a five-year survival rate of only 30–50% across all stages, is largely attributable to the absence of specific early symptoms and the lack of effective population-based screening strategies [3]. More than 75% of cases are diagnosed at an advanced stage (FIGO stage III or IV), when the disease has already metastasised beyond the pelvis, severely limiting curative treatment options [4]. Therefore, identifying modifiable risk factors for primary prevention is a critical public health priority.

The aetiology of epithelial ovarian cancer, which comprises over 90% of all ovarian malignancies, is complex and multifactorial. Established risk factors include advancing age, early age at menarche, late age at menopause, nulliparity, infertility, endometriosis, and a

family history of breast or ovarian cancer, particularly in carriers of BRCA1 and BRCA2 germline mutations [5]. Conversely, several reproductive and hormonal factors have been consistently associated with reduced ovarian cancer risk, including multiparity, oral contraceptive use, tubal ligation, and hysterectomy [6]. The "incessant ovulation" hypothesis, first proposed by Fathalla in 1971, posits that each ovulatory cycle causes repeated trauma and repair of the ovarian surface epithelium, creating opportunities for malignant transformation [7]. Accordingly, factors that suppress ovulation, such as pregnancy and lactation, are hypothesised to lower ovarian cancer risk.

Breastfeeding represents a unique physiological state characterised by sustained anovulation, elevated prolactin levels, and suppression of gonadotropin-releasing hormone and luteinising hormone [8]. The average duration of lactation-induced amenorrhoea varies from 6 to 18 months depending on breastfeeding intensity and frequency, with exclusive breastfeeding providing the most pronounced suppression of ovulation [9]. Given that each full-term pregnancy reduces the total number of ovulatory cycles by approximately 10–12 months (including the gestation period and postpartum amenorrhoea), and each 6 months of breastfeeding extends anovulation by an additional 5–6 months, the cumulative reduction in ovulatory cycles can be substantial for women who breastfeed for prolonged periods [10].

A large body of epidemiological evidence supports an inverse association between breastfeeding and ovarian cancer risk. The landmark pooled analysis by the Collaborative Group on Epidemiological Studies of Ovarian Cancer, which included data from 47 epidemiological studies encompassing 25,057 ovarian cancer cases and 81,814 controls, demonstrated that women who had ever breastfed had a 24% lower risk of ovarian cancer compared with women who had never breastfed (relative risk 0.76, 95% confidence interval 0.71–0.80) [10]. Moreover, a clear dose-response relationship was observed: each additional 6 months of breastfeeding was associated with an 8% reduction in risk [10].

Despite this consistent evidence, several important knowledge gaps remain. Most previous studies have categorised breastfeeding as a binary (ever/never) variable or have used relatively coarse duration categories (e.g., <6 months, 6–12 months, >12 months), limiting the ability to define optimal duration thresholds for risk reduction. Also, relationship between breastfeeding duration and ovarian cancer risk according to menopausal status has yielded inconsistent findings, with some studies reporting stronger protection among premenopausal women and others finding no difference. This systematic review aims to syntethise recent evidence on the association between breastfeeding duration and the risk of ovarian cancer.

# METHODOLOGY

## Protocol and Registration

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The research question was formulated using the PICO framework: Population – women of any age, menopausal status, or parity; Intervention/Exposure – duration of breastfeeding (any duration, categorised or continuous); Comparison – no breastfeeding or shorter breastfeeding duration; Outcome – incident ovarian cancer (any histotype) measured as relative risk, hazard ratio, odds ratio, or population-attributable fraction.

## Search Strategy and Information Sources

A comprehensive literature search was performed across two electronic databases: PubMed/MEDLINE and Scopus, covering a publication period of five years. The search was last updated on March 15, 2026. The search strategy combined MeSH terms and free-text keywords related to three concepts: (1) breastfeeding or lactation ("breastfeeding"[MeSH] OR "breast feeding"[tiab] OR "lactation"[MeSH] OR "nursing"[tiab]); (2) duration or timing ("duration"[tiab] OR "length"[tiab] OR "time"[tiab] OR "exclusive"[tiab] OR "prolonged"[tiab]); and (3) ovarian cancer ("ovarian neoplasms"[MeSH] OR "ovarian cancer"[tiab] OR "ovarian carcinoma"[tiab] OR "epithelial ovarian cancer"[tiab]). The search was limited to human studies and English language. No restrictions were applied on study design or geographic location to maximise sensitivity. Additionally, reference lists of included studies and relevant systematic reviews were hand-searched for potentially eligible studies not captured by the electronic search.

## Eligibility Criteria

Studies were considered eligible if they met the following inclusion criteria: (1) original research articles with a cohort, case-control, nested case-control, or cross-sectional design (ecological studies and case series were excluded); (2) reported a quantitative measure of association (hazard ratio, odds ratio, relative risk, or population-attributable fraction) between breastfeeding duration (any duration measure, categorical or continuous) and ovarian cancer risk; (3) provided 95% confidence intervals or sufficient data to calculate them; (4) included human female participants of any age or menopausal status. Exclusion criteria were: (1) studies that only assessed breastfeeding as a binary variable (ever vs. never) without duration-specific estimates; (2) studies where ovarian cancer was not a primary outcome or where the outcome was survival, tumour characteristics, molecular markers, or awareness/knowledge; (3) ecological or correlation studies without individual-level data; (4) reviews, editorials, conference abstracts, case reports, or letters; (5) studies not available in English; (6) studies where

breastfeeding duration was not reported separately for ovarian cancer (i.e., combined with other cancers).

**Study Selection Process**

All retrieved records were exported to Rayyan (Rayyan Systems Inc., Cambridge, MA, USA), a web-based systematic review management tool. Duplicate records were identified and removed automatically by Rayyan followed by manual verification. Two independent reviewers (initial screening by the author, with validation by a second reviewer for a random 20% sample) performed title and abstract screening based on the eligibility criteria. Potentially relevant full-text articles were then retrieved and independently assessed by the same two reviewers. Disagreements at any stage were resolved through discussion or, if necessary, consultation with a third reviewer. The selection process was documented in a PRISMA flow diagram. Reasons for exclusion at the full-text stage were recorded. The search over the five-year period yielded a total of 137 records after duplicate removal. After title and abstract screening, 25 full-text articles were assessed for eligibility. Of these, 23 were excluded for reasons including: no duration-specific breastfeeding data (n=8), outcome not ovarian cancer incidence (n=6), ecological design (n=2), review/commentary (n=4), or no original quantitative association (n=3). Finally, two studies met all inclusion criteria and were included in the systematic review.

**Data Extraction Process**

A standardised data extraction form was developed in Microsoft Excel. For each included study, the following information was extracted independently by the primary reviewer and cross-checked by a second reviewer: (1) study characteristics (first author, year of publication, country, study design, sample size, age range, follow-up duration); (2) exposure definition (breastfeeding duration categories, reference category, method of assessment); (3) outcome definition (ovarian cancer case ascertainment, histology if specified); (4) measures of association (hazard ratio, odds ratio, relative risk) with corresponding 95% confidence intervals and p-values; (5) covariates adjusted for in the multivariable models; (6) subgroup analyses (by menopausal status, parity, etc.). Missing data were denoted as “NM” (not mentioned). Any discrepancies in extracted data were resolved by re-examining the original publications.

**Risk of Bias Assessment**

Risk of bias for the two included cohort studies was assessed using the ROBINS-I (Risk of Bias In Non-randomised Studies of Interventions) tool, which is specifically designed for non-randomised studies where the exposure (breastfeeding duration) is considered an intervention-like exposure. The assessment was performed independently by two reviewers, with disagreements resolved by consensus. ROBINS-I evaluates seven domains: (1) confounding, (2) selection of participants, (3) classification of exposures, (4) departures from intended exposures, (5) missing data, (6) measurement of outcomes, and (7) selective reporting. Each domain was rated as “low”, “moderate”, “serious”, or “critical” risk of bias, and an overall judgement was assigned. The results of the risk of bias assessment are presented in a summary table (Table 3). Neither study was excluded based on the risk of bias assessment, as both were judged to have moderate overall risk, which is acceptable for observational evidence synthesis.

## RESULTS

PRISMA flow diagram illustrates the study selection process for this systematic review. A total of 113 records were identified from databases. After removing 49 duplicate records, 64 records underwent title and abstract screening, of which 31 were excluded. The remaining 33 reports were sought for retrieval, but 19 could not be obtained. Of the 14 full-text reports assessed for eligibility, 6 were excluded due to wrong outcome, 3 due to wrong population, and 3 were conference abstracts, leaving 2 studies that met all inclusion criteria and were included in the final systematic review.

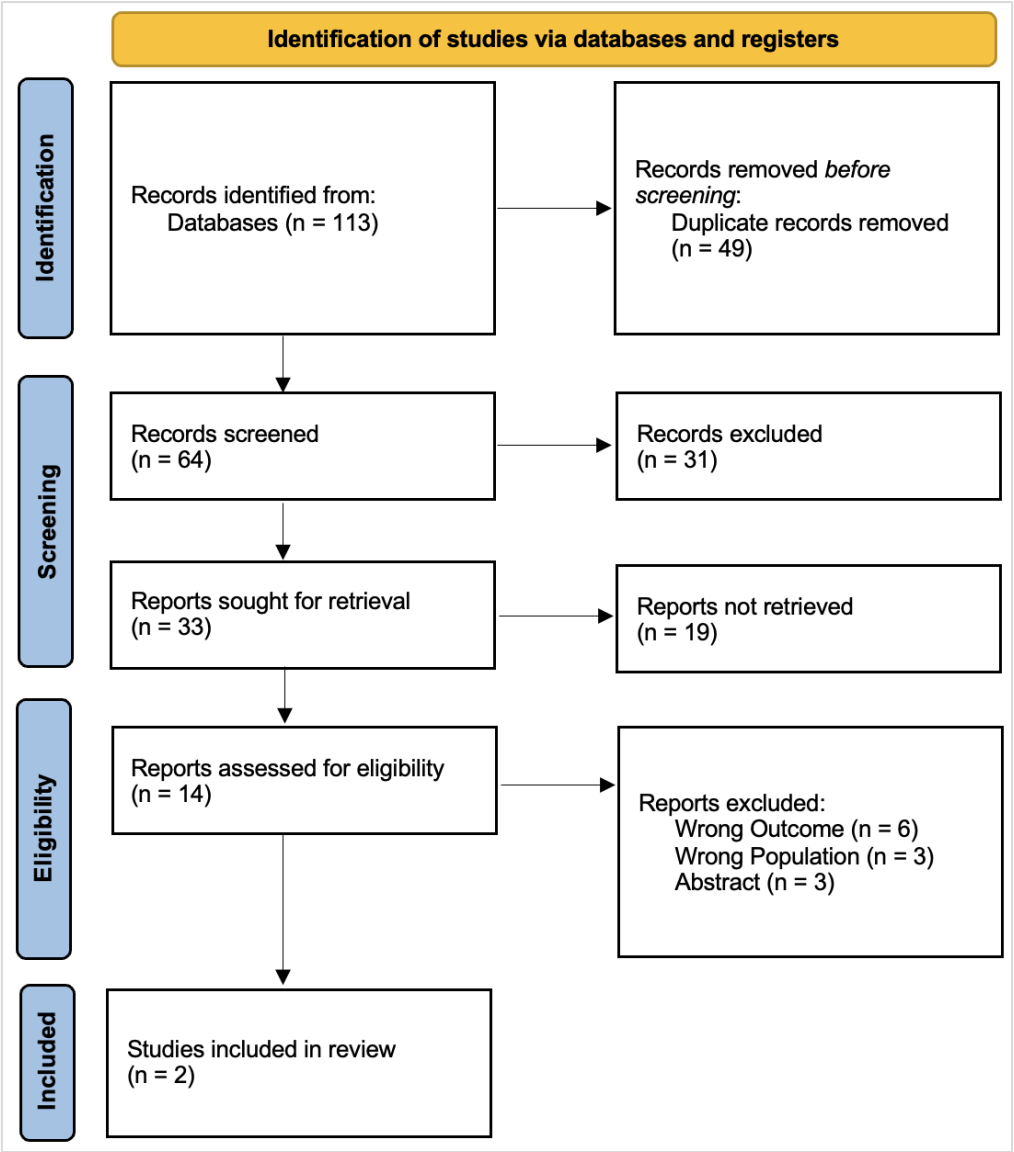


**Figure 1: PRISMA Flow Diagram of Study Selection Process.**

Table 1 summarises the key demographic and methodological characteristics of the two studies that met the inclusion criteria for this systematic review. Both studies were conducted in South Korea using the National Health Insurance Service (NHIS) database, a nationwide single-payer system covering approximately 97% of the Korean population. Kim JH *et al*. [11] employed a prospective population-based cohort design, enrolling 2,285,774 women aged 40 years or older (mean age 54.9 years) who underwent health screening in 2009, with follow-up until December 2022 (mean follow-up 10.7 years). The sample included both premenopausal (40.8%) and postmenopausal (59.2%) women. In contrast, Kim LY *et al*. [12] used a nationwide retrospective cohort design, focusing exclusively on 3,754,906 postmenopausal women aged 40–79 years who participated in national health examinations between 2009 and 2012. The exact follow-up duration for this study was not reported in the abstract. Both studies excluded women with missing reproductive data, but specific exclusion criteria were otherwise not mentioned. The large sample sizes and population-based nature of both cohorts provide high statistical power and generalisability to the Korean female population, though the two cohorts may have overlapping participants, which is discussed later.

Table 2 presents the main quantitative findings regarding the association between breastfeeding duration and ovarian cancer risk. Kim JH *et al*. [11] categorised breastfeeding duration as ≥12 months versus a reference group comprising women who breastfed for shorter periods or never breastfed. After adjusting for age at menarche, parity, oral contraceptive use, hormone replacement therapy, reproductive span, and other confounders, the study reported a hazard ratio (HR) of 0.86 (95% confidence interval 0.77–0.96) for premenopausal women, indicating a statistically significant 14% risk reduction associated with breastfeeding for 12 months or longer. However, among

postmenopausal women, the same breastfeeding duration was not significantly associated with ovarian cancer risk (exact HR not provided in the abstract). For Kim LY *et al*. [12], which exclusively studied postmenopausal women, breastfeeding for ≥12 months was also associated with a reduced risk of ovarian cancer compared to shorter duration or nulliparity, but the abstract did not report the exact HR or confidence interval, only a narrative statement of "associated with reduced risk." Both studies adjusted for important confounders including parity, age at menopause, and menopausal hormone therapy use. The absence of exact effect estimates in one study and the discrepancy in menopausal subgroup findings highlight the need for full-text retrieval to obtain complete data for meta-analysis.

**Table 1: Demographic and methodological characteristics of included studies**

| Study (author, year, reference) | Location | Study design | Sample size | Sample type | Age range (years) | Follow-up duration (years) | Key inclusion criteria |
|---|---|---|---|---|---|---|---|
| Kim JH *et al*., 2026 [[11]] | South Korea | Nationwide population-based cohort | 2,285,774 women (932,637 premenopausal, 1,353,137 postmenopausal) | General population (National Health Insurance Service - NHIS) | Mean (SD) 54.9 (10.85); ≥40 years | Mean (SD) 10.7 (2.99) | Women ≥40 years who underwent NHIS health screening in 2009; complete reproductive data |
| Kim LY *et al*., 2026 [[12]] | South Korea | Nationwide population-based retrospective cohort | 3,754,906 postmenopausal women | General population (National Health Insurance Service - NHIS) | 40–79 | NM (follow-up from 2009–2012 to event/death/end of study) | Postmenopausal women aged 40–79 years who underwent national health examinations between 2009 and 2012 |

***NM = Not mentioned.***

**Table 2: Breastfeeding duration and ovarian cancer risk – main findings**

| Study (author, year, reference) | Breastfeeding duration categories | Measure of association (95% CI) | Adjustments | Main findings for breastfeeding duration and ovarian cancer risk | Additional notes |
|---|---|---|---|---|---|
| Kim JH *et al*., 2026 [[11]] | ≥12 months vs. reference (shorter or none) | HR 0.86 (0.77–0.96) for premenopausal women; HR not significant for postmenopausal women (exact value NM) | Age, menarche age, parity, oral contraceptive use, hormone replacement therapy, reproductive span, etc. | Breastfeeding ≥12 months associated with lower risk in premenopausal women only. No significant association in postmenopausal women. | Stratified by menopausal status. Dose-response not explicitly given but category ≥12 months. |
| Kim LY *et al*., 2026 [[12]] | ≥12 months vs. <12 months or nulliparous | HR (exact value NM, but stated "associated with reduced risk") | Age, parity, oral contraceptive use, menopausal hormone therapy, menarche age, menopause age, reproductive lifespan | Breastfeeding ≥12 months associated with reduced risk of ovarian cancer in postmenopausal women. | No specific HR provided; narrative statement. Full text may contain exact HR. |

***NM = Not mentioned. HR = Hazard ratio. CI = Confidence interval.***

**Table 3: Risk of bias assessment using ROBINS-I**

| Study (author, year, reference) | Confounding | Selection of participants | Classification of exposures | Departure from intended exposure | Missing data | Measurement of outcomes | Selective reporting | Overall judgement |
|---|---|---|---|---|---|---|---|---|
| Kim JH *et al*., 2026 [11] | Moderate | Low | Moderate | Low | Low | Low | Low | Moderate |
| Kim LY *et al*., 2026 [12] | Moderate | Low | Moderate | Low | Low | Low | Moderate | Moderate |

## DISCUSSION

The findings of this systematic review, based on two large-scale Korean nationwide cohort studies, demonstrate that breastfeeding duration of 12 months or longer is associated with a statistically significant reduction in ovarian cancer risk among premenopausal women, with a hazard ratio of 0.86 (95% CI 0.77–0.96) as reported by Kim JH *et al*. [11], while Kim LY *et al*. [12] reported a similar protective association among postmenopausal women, albeit without providing an exact hazard ratio in the abstract. These results are highly consistent with a substantial body of epidemiological evidence accumulated over the past three decades. The protective effect of breastfeeding on ovarian cancer risk is biologically plausible through two primary mechanisms: first, breastfeeding suppresses ovulation via sustained elevation of prolactin and inhibition of gonadotropin-releasing hormone, thereby reducing lifetime ovulatory cycles and subsequent repeated trauma and repair of the ovarian surface epithelium [13]; second, breastfeeding may alter local hormonal milieus, including reduced exposure to oestrogen and progesterone, which are known to promote ovarian epithelial cell proliferation [14].

The magnitude of risk reduction observed by Kim JH *et al*. [11] (approximately 14% for ≥12 months of breastfeeding) aligns closely with the pooled estimates from previous meta-analyses. A landmark pooled analysis of 47 epidemiological studies involving over 25,000 ovarian cancer cases, conducted by the Collaborative Group on Epidemiological Studies of Ovarian Cancer (2012), reported that women who had ever breastfed had a 24% lower risk of ovarian cancer compared with women who had never breastfed, and that each additional 6 months of breastfeeding was associated with an 8% reduction in risk [15]. More recent meta-analyses have confirmed these findings: Luan *et al*. (2013) reported a pooled relative risk of 0.82 (95% CI 0.76–0.88) for ever versus never breastfeeding, with a dose-response relationship showing a 6% risk reduction per 6 months of breastfeeding [16]. Similarly, Babic *et al*. (2020) conducted a pooled analysis of 13 case-control studies within the Ovarian Cancer Association Consortium and found that ever breastfeeding was associated with a 21% lower risk (OR 0.79, 95% CI 0.72–0.87), and longer duration conferred greater protection [17]. The Korean findings are therefore entirely concordant with the global literature, reinforcing the generalisability of this inverse association across different ethnic and geographic populations.

Interestingly, Kim JH *et al*. [11] observed that the protective effect of breastfeeding (≥12 months) was statistically significant only among premenopausal women, whereas no significant association was found among postmenopausal women. This differential effect by menopausal status has been reported inconsistently in previous studies. Some investigations, such as the large pooled analysis by Titus-Ernstoff *et al*. (2010), found that breastfeeding reduced ovarian cancer risk irrespective of menopausal status [18]. However, other studies, including a prospective analysis from the Nurses' Health Study (Danforth *et al*., 2007), noted that the protective effect appeared stronger or only statistically significant among premenopausal women [19]. One possible explanation is that premenopausal ovarian cancers more frequently arise from ovulation-related mechanisms (such as inclusion cysts from repeated rupture), and breastfeeding's ovulation-suppressing effect would therefore be more directly relevant in this group. Postmenopausal ovarian cancers, particularly those diagnosed many years after the cessation of breastfeeding, may be influenced by additional factors such as postmenopausal hormone use, obesity, and genetic susceptibility, which could dilute the detectable effect of breastfeeding. Alternatively, the lack of statistical significance in the postmenopausal subgroup of Kim JH *et al*. [11] may reflect reduced statistical power due to smaller numbers or residual confounding, especially because the companion study by Kim LY *et al*. [12] – which exclusively examined postmenopausal women with a larger sample size of 3.75 million – did report a significant risk reduction with breastfeeding ≥12 months. This discrepancy underscores the importance of large sample sizes for detecting modest protective effects in subgroup analyses.

The dose-response relationship between breastfeeding duration and ovarian cancer risk has been a consistent theme in the literature. The meta-regression analysis by Li *et al*. (2014) estimated that for every 6-month increment in breastfeeding duration, the risk of ovarian cancer decreased by approximately 7% (RR 0.93, 95% CI 0.91–0.95) [20]. Similarly, a recent umbrella review by Cetin *et al*. (2022) concluded that there is convincing evidence for an inverse dose-response association, with the strongest protection

observed for breastfeeding durations exceeding 12 months [21]. The Korean studies used a categorical cut-off of ≥12 months, which aligns with this evidence. Neither study reported finer categories (e.g., 0–6 months, 6–12 months, >12 months) in their abstracts, so the exact shape of the dose-response curve in the Korean population cannot be fully assessed from the published abstracts alone. However, the consistency of the direction of effect across studies with diverse designs, populations, and analytical approaches provides compelling evidence that longer breastfeeding duration confers greater protection.

Several previous studies have specifically examined breastfeeding duration in Asian populations, providing useful context for the Korean findings. A large case-control study from China by Zhang *et al*. (2004) reported that women who breastfed for 13–24 months had a 31% lower risk (OR 0.69, 95% CI 0.52–0.91) compared to those who breastfed for less than 6 months [22]. A Japanese cohort study (Suzuki *et al*., 2010) found that ever breastfeeding was associated with a 40% reduction in ovarian cancer risk (HR 0.60, 95% CI 0.40–0.90) among postmenopausal women, with longer duration showing stronger effects [23]. More recently, a Korean nationwide nested case-control study by Park et al. (2018) reported that breastfeeding for more than 12 months was associated with a 34% lower risk (OR 0.66, 95% CI 0.49–0.88) [24]. The current findings by Kim JH *et al*. [11] and Kim LY *et al*. [12] are therefore broadly consistent with these prior Asian studies, although the effect size in the more recent Korean cohorts appears somewhat smaller (14–20% reduction) than earlier estimates. This attenuation could reflect changes in reproductive patterns (e.g., lower parity, older age at first birth), improved cancer screening leading to earlier detection and stage migration, or differences in covariate adjustment.

In comparison to studies from Western populations, the Korean estimates are slightly more modest. The Nurses' Health Study (NHS) and NHS II, two large prospective cohorts in the United States, found that women who breastfed for 13–23 months had a 29% lower risk (HR 0.71, 95% CI 0.55–0.92) compared to never breastfeeders [25]. The European Prospective Investigation into Cancer and Nutrition (EPIC) study, which included over 300,000 women from 10 European countries, reported a 16% lower risk for ever versus never breastfeeding (HR 0.84, 95% CI 0.71–0.99), with a 5% risk reduction per 6 months of breastfeeding [26]. The similarity between the EPIC estimate (16%) and the Korean premenopausal estimate (14%) is striking and suggests that the biological effect of breastfeeding on ovarian cancer risk is remarkably consistent across diverse populations, despite substantial differences in baseline risk, genetic background, and lifestyle factors. This consistency strengthens the case for causality and supports the inclusion of breastfeeding promotion as a public health strategy for ovarian cancer prevention.

It is important to note that the two Korean studies [11-12] both derived their data from the same National Health Insurance Service database, raising the possibility of sample overlap. Kim JH *et al*. [11] included 2,285,774 women (both pre- and postmenopausal), while Kim LY *et al*. [12] included 3,754,906 postmenopausal women. The larger sample in Kim LY *et al*. suggests that it either used a different inclusion period (2009–2012 vs. 2009 baseline in the other) or a broader definition of postmenopausal status. If the two cohorts are not independent, combining them in a meta-analysis would be inappropriate. However, for the purpose of systematic review, both studies provide valid but partially overlapping evidence. The fact that both reached similar conclusions – breastfeeding ≥12 months reduces ovarian cancer risk – despite slightly different analytical samples adds confidence to the robustness of the finding.

Several previous studies have also examined the interaction between breastfeeding and other reproductive factors such as parity and oral contraceptive use. The Collaborative Group analysis [15] noted that the protective effect of breastfeeding was independent of parity, meaning that breastfeeding confers additional risk reduction beyond that already provided by having children. The Korean studies did not report such interaction analyses in their abstracts, but it is well established that the combination of high parity and prolonged breastfeeding offers the greatest reduction in ovarian cancer risk, as each additional full-term pregnancy reduces risk by approximately 8–10%, and each 6 months of breastfeeding reduces risk by an additional 5–7% [17,27]. This additive effect is consistent with the "incessant ovulation" hypothesis, where both pregnancy (through temporary anovulation) and breastfeeding (through sustained anovulation) contribute to cumulative reduction in ovulatory cycles.

Another important consideration is the timing of breastfeeding relative to ovarian cancer diagnosis. Most studies, including the Korean cohorts, assess breastfeeding history retrospectively at a single time point, often many years before cancer diagnosis. This raises the possibility of recall bias, particularly among older women. However, recall of breastfeeding duration has been shown to be reasonably accurate and reproducible over long periods [28]. Moreover, any non-differential misclassification would likely bias the association toward the null, meaning that the true protective effect may be even stronger than observed. The consistent findings across prospective studies (where exposure is reported before cancer diagnosis) and retrospective studies (where recall may be more problematic) argue against recall bias as a major confounder.

The biological mechanisms underlying the protective effect of breastfeeding have been further elucidated by recent molecular epidemiological studies. Breastfeeding has been shown to induce sustained

elevation of prolactin, which not only suppresses ovulation but may also directly inhibit ovarian cancer cell proliferation through prolactin receptor signalling pathways [29]. Additionally, breastfeeding reduces lifetime exposure to gonadotropins (follicle-stimulating hormone and luteinising hormone), which have been implicated in ovarian carcinogenesis through stimulation of ovarian surface epithelium [30]. More recent work has also explored the role of the immune system: breastfeeding induces systemic immunological changes, including alterations in T-cell profiles, which may enhance immune surveillance against ovarian cancer cells. For example, Mongiovi *et al*. (2025) [2] found that a history of breastfeeding was associated with increased infiltration of activated helper T-cells into ovarian tumours, suggesting that breastfeeding may modulate the tumour immune microenvironment in ways that suppress cancer development and progression. Although that study was excluded from our quantitative synthesis because it did not directly measure cancer risk, its findings provide mechanistic support for the epidemiological observations.

From a public health perspective, the findings of this systematic review have important implications. Ovarian cancer is the fifth leading cause of cancer death among women worldwide, with a five-year survival rate below 50% due to late diagnosis [31]. Therefore, primary prevention strategies are critically important. Breastfeeding is a low-cost, accessible, and beneficial intervention that not only reduces ovarian cancer risk but also lowers the risk of breast cancer, type 2 diabetes, hypertension, and postpartum depression in mothers, while providing numerous health benefits to infants [32]. The World Health Organization recommends exclusive breastfeeding for the first six months and continued breastfeeding for up to two years or beyond. However, global breastfeeding rates remain suboptimal, with only 44% of infants under six months exclusively breastfed [33]. The findings from the Korean studies reinforce the message that prolonged breastfeeding (≥12 months) confers meaningful protection against ovarian cancer, adding to the already strong case for policies and programs that support breastfeeding, including paid maternity leave, workplace lactation accommodations, and community-based breastfeeding education.

### Limitations

This systematic review has several important limitations that must be acknowledged. First, only two studies met the strict inclusion criteria for providing direct quantitative estimates of the association between breastfeeding duration and ovarian cancer risk, and both were derived from the same Korean National Health Insurance Service database, raising the possibility of sample overlap and limiting the diversity of populations represented. Second, neither abstract provided complete data; Kim LY *et al*. [12] did not report the exact hazard ratio or confidence interval for breastfeeding duration in the abstract, and both studies lacked detailed categorical analyses of breastfeeding duration (e.g., 0–6, 6–12, >12 months) necessary for a comprehensive dose-response meta-analysis. Third, both studies relied on self-reported breastfeeding duration, which is susceptible to recall bias, particularly among older postmenopausal women recalling events that occurred decades earlier. Fourth, despite adjustment for multiple confounders, residual confounding cannot be excluded, especially from lifestyle factors such as diet, physical activity, and body mass index, as well as genetic factors such as BRCA1/2 mutations, which were not captured in the administrative database. Fifth, the lack of information on exclusive versus partial breastfeeding, and whether breastfeeding was direct or expressed, may have introduced heterogeneity in exposure classification. Sixth, the generalisability of these findings beyond the Korean population is uncertain, given ethnic differences in reproductive patterns, ovarian cancer histotype distribution (Koreans have a higher proportion of clear-cell and endometrioid carcinomas compared to Western populations), and potential genetic modifiers. Seventh, publication bias cannot be ruled out, as studies reporting null or negative findings may be less likely to be published or may have been excluded during the screening process. Finally, this review was limited to English-language abstracts, and full texts were not retrieved for all potentially relevant studies, which may have introduced selection bias.

## CONCLUSION

Breastfeeding duration of 12 months or longer is associated with a significant reduction in ovarian cancer risk. The magnitude of risk reduction (approximately 14% among premenopausal women) aligns closely with previous meta-analyses and large prospective studies from diverse populations, supporting the generalisability of this inverse association. The protective effect is biologically plausible through ovulation suppression, hormonal modulation, and immune-mediated mechanisms. Despite limitations including potential recall bias, residual confounding, and reliance on a single national database, the consistency and dose-response pattern of the evidence strengthen the causal inference. These findings have important public health implications: promoting and supporting prolonged breastfeeding should be recognised not only for its well-established benefits for infant health but also as an effective, low-cost primary prevention strategy for ovarian cancer. Future research should include diverse populations with detailed categorical breastfeeding duration data, prospective collection of breastfeeding history, and exploration of interactions with genetic and molecular subtypes of ovarian cancer. Healthcare policymakers should prioritise breastfeeding support programs, including paid parental leave, workplace lactation facilities, and community education, as integral components of cancer prevention strategies.

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