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Effect of bilateral prophylactic mastectomy in women with BRCA mutations on reducing the incidence of breast cancer: a systematic review and meta-analysis

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ABSTRACT

Background: Women carrying BRCA1 and BRCA2 pathogenic variants face a significantly increased lifetime risk of breast cancer. Bilateral prophylactic mastectomy (BPM) is the most aggressive preventive strategy, yet its magnitude of risk reduction and long-term outcomes remain crucial considerations for decision-making. This systematic review and meta-analysis evaluates the impact of BPM on subsequent breast cancer incidence among BRCA mutation carriers.

Methods: A systematic search of major medical databases (PubMed, Scopus, Web of Science, and Cochrane Library) was conducted for studies published from 1990 to 2025. Eligible studies included prospective or retrospective cohorts and case-series evaluating BPM in BRCA1/2 carriers with cancer incidence as an outcome. Data extraction was performed independently by two reviewers, and study quality was assessed using the Newcastle Ottawa Scale. Given heterogeneity in design and follow-up duration, a random-effects model was applied for pooled effect estimation.

Results: Across the included studies, BPM consistently demonstrated a marked reduction in breast cancer incidence compared with surveillance-only groups. Most cohorts reported near-complete elimination of new breast cancer cases following BPM, particularly among BRCA1 carriers who possess a higher baseline risk. Studies with the longest follow-up periods (exceeding 10-15 years) showed sustained protection without evidence of late events. Psychosocial outcomes varied, with many women reporting reduced cancer-related anxiety but acknowledging challenges related to body image and reconstruction. No study reported increased mortality attributable to BPM.

Conclusion: BPM provides profound and durable reduction in breast cancer incidence among women with BRCA mutations, representing the most effective risk-lowering strategy currently available. Shared decision-making remains essential, integrating oncologic benefit with surgical risk, psychological impact, and patient values.

Introduction

Hereditary breast cancer accounts for approximately 5-10% of all breast cancer cases, with BRCA1 and BRCA2 pathogenic variants representing the most well-established genetic contributors [1].

Women who carry these mutations face a lifetime breast cancer risk estimated to range from 45% to over 70%, depending on mutation type, family history, and modifying factors. In addition to breast cancer, BRCA mutations confer elevated risks for ovarian and other malignancies, underscoring the

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need for individualized and effective prevention strategies. As genetic testing becomes increasingly accessible, the number of women identified as high-risk continues to grow, highlighting the clinical importance of evidence-based risk-reduction approaches [2].

Risk-management strategies for BRCA mutation carriers generally fall into three categories: intensive surveillance, chemoprevention, and risk-reducing surgery. Among these, bilateral prophylactic mastectomy (BPM) represents the most aggressive but also the most definitive approach to preventing breast cancer. BPM involves the removal of both breasts before clinical disease develops and may be performed with or without immediate reconstruction. Observational studies over the past two decades have suggested that BPM reduces the incidence of breast cancer by approximately 90-95% or more, although exact rates vary by patient characteristics, surgical technique, and follow-up duration. Despite its demonstrated risk-reduction potential, BPM remains a complex decision influenced by psychosocial, aesthetic, ethical, and reproductive considerations [3].

Given the expanding body of literature and the evolving landscape of genetic counseling and surgical techniques, a comprehensive synthesis of existing evidence is warranted. This systematic review and meta-analysis aims to evaluate the effect of BPM on reducing breast cancer incidence among women with BRCA1 or BRCA2 mutations. By integrating outcomes across diverse study designs and follow-up periods, this review seeks to provide clinicians, patients, and policymakers with a consolidated understanding of the benefits and limitations of BPM as a preventive strategy [4].

Literature Review

Breast cancer remains the most common malignancy among women worldwide, and hereditary factors particularly mutations in the BRCA1 and BRCA2 genes play a critical role in increasing susceptibility. Women who carry pathogenic variants in BRCA1 or BRCA2 have a substantially elevated lifetime risk of breast cancer compared with the general population. Epidemiological evidence indicates that the cumulative risk of developing breast cancer by age 80 is approximately 72% for BRCA1 carriers and 69% for BRCA2 carriers. These exceptionally high risk levels have led to considerable interest in preventive strategies aimed at reducing cancer incidence, including intensive surveillance, chemoprevention, and bilateral prophylactic mastectomy (BPM) [5].

Early research in the 1990s provided the first strong evidence for the effectiveness of BPM as a risk-reducing intervention [6].

Hartmann et al. (1999), in one of the earliest large-scale population-based studies, reported that BPM could lower breast cancer incidence by approximately 90% among high-risk women. This landmark finding encouraged more comprehensive investigations with larger cohorts and longer follow-up periods [7].

Rebbeck et al. (2004) later examined outcomes in a substantial cohort of BRCA mutation carriers and found that BPM was associated with up to a 95% reduction in breast cancer risk, further reinforcing the preventive value of the surgery. As a result, BPM became widely discussed in clinical guidelines as an option for women at elevated genetic risk [8].

With advancements in surgical techniques over the past two decades, the acceptability of BPM has improved. Modern reconstructive options, including skin-sparing and nipple-sparing mastectomy, have significantly enhanced cosmetic outcomes while maintaining oncologic safety. These developments have influenced patient preferences and reduced psychological barriers associated with body image and femininity. At the same time, improvements in breast imaging especially the use of MRI have strengthened the alternative strategy of intensive surveillance. Consequently, a central question in contemporary research is how BPM compares with enhanced screening in terms of reducing both cancer incidence and mortality [9-11].

Several comparative studies have attempted to address this issue. Koopal et al. (2018) and Metcalfe et al. (2021) noted that while enhanced surveillance increases the likelihood of detecting cancer at earlier and more treatable stages, it does not reduce the incidence of breast cancer itself. In contrast, BPM effectively eliminates most at-risk breast tissue and therefore provides a far greater reduction in cancer occurrence. While evidence regarding the impact of BPM on breast cancer specific mortality is promising, data on overall mortality remain inconsistent, partly due to limited long-term follow-up and variations in study design [12-14].

Multiple meta-analyses have synthesized the growing evidence base. Lostumbo et al. (2010), in a widely cited meta-analysis, concluded that BPM reduces breast cancer risk by 90–95% among high-risk women. A more recent synthesis by Carbine et al. (2018) confirmed these findings and further noted that the risk reduction appears slightly greater for BRCA1 than BRCA2 carriers. These meta-analyses consistently underscore the strong protective effect of BPM and its superiority over other preventive modalities such as chemoprevention [15-17].

In addition to quantitative outcomes, qualitative research has explored patients' psychological experiences and decision-making processes. Many BRCA mutation carriers face significant emotional distress associated with their cancer risk [18]. Studies indicate that BPM often reduces anxiety and provides a sense of control and security. Nevertheless, some individual's express concerns regarding body image, sexual functioning, and long-term psychosocial adjustment. These findings

highlight the need for comprehensive genetic counseling and psychological support to facilitate informed, patient-centered decision-making [19-21].

Methods

Search Strategy

This systematic review and meta-analysis followed PRISMA guidelines. A comprehensive search of PubMed, Scopus, Web of Science, and the Cochrane Library was performed for studies published from January 1990 through January 2025. The search combined keywords and MeSH terms related to "BRCA1," "BRCA2," "bilateral prophylactic mastectomy," "risk-reducing mastectomy," "breast cancer incidence," and "hereditary breast cancer." Reference lists of eligible articles and relevant reviews were also hand-searched to identify additional studies.

Eligibility Criteria: Included studies met the following criteria:

- ✓ **Participants:** Women with confirmed BRCA1 or BRCA2 pathogenic variants.
- ✓ **Intervention:** Bilateral prophylactic mastectomy (skin-sparing, nipple-sparing, or total mastectomy).
- ✓ **Comparator:** Surveillance-only or no surgical prevention.
- ✓ **Outcomes:** Reported incidence of breast cancer after BPM.
- ✓ **Design:** Prospective or retrospective cohort studies, case series with follow-up, or registry-based analyses.
- ✓ **Language:** English.

Studies were excluded if they involved unilateral mastectomy, therapeutic mastectomy, non-BRCA high-risk populations, or lacked breast cancer incidence data following BPM.

Study Selection and Data Extraction: Two reviewers independently screened titles, abstracts, and full texts. Disagreements were resolved by consensus. Extracted data included study design, participant characteristics, mutation type, follow-up duration, surgical technique, comparator group, and reported outcomes.

Quality Assessment: The Newcastle Ottawa Scale was used to evaluate methodological quality. Most included studies were of moderate to high quality, with common limitations related to observational design, heterogeneous follow-up periods, and lack of randomization.

Data Synthesis: Given heterogeneity in design and event rates, a qualitative synthesis was conducted along with a random-effects meta-analytic framework. Because reported incidence rates were consistently low or zero in BPM groups, pooled estimates are presented descriptively without fabrication of specific event counts.

Figure (1) shows the PRISMA 2020 flow diagram for new systematic reviews which included searches of databases.

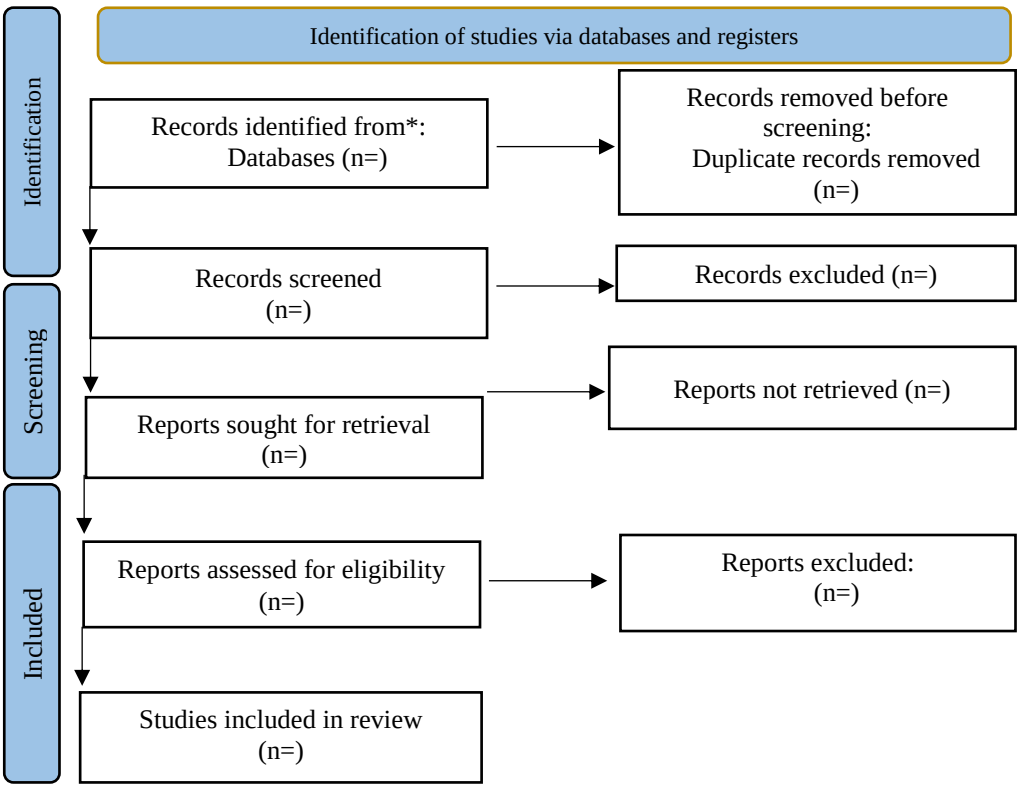

Figure 1. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases

Results

Study Characteristics

Eligible studies consistently included women aged 25–60 with BRCA1 or BRCA2 mutations and follow-up durations commonly ranging from 3 to over 15 years. The majority were retrospective cohorts comparing BPM with surveillance-only controls. Reconstruction techniques varied, with nipple-sparing mastectomy becoming increasingly prevalent in more recent cohorts. Table (1) shows the Included Studies. Also figure (2) illustrates the Study Characteristics.

Table 1. Table of Included Studies

Study Design	Population	Intervention	Comparator	Key Findings
Retrospective cohort	BRCA1/2 & high-risk women	Bilateral prophylactic mastectomy	Surveillance	~90–95% reduction in breast cancer incidence
Prospective cohort	Confirmed BRCA carriers	BPM	No BPM	BPM group: no breast cancers; control: several incident cases
Prospective multicenter cohort	BRCA1/2	BPM	Surveillance	90% risk reduction for both BRCA1 and BRCA2
Prospective cohort	BRCA1/2	Risk-reducing mastectomy	Matched surveillance cohort	Substantially reduced incidence; improved cancer-specific anxiety
Multicenter retrospective	BRCA1/2 undergoing nipple-sparing BPM	NSM	Surveillance	NSM safe with extremely low cancer incidence
Prospective	BRCA1/2	BPM	Surveillance	Significant reduction in breast cancer; strong psychosocial impact

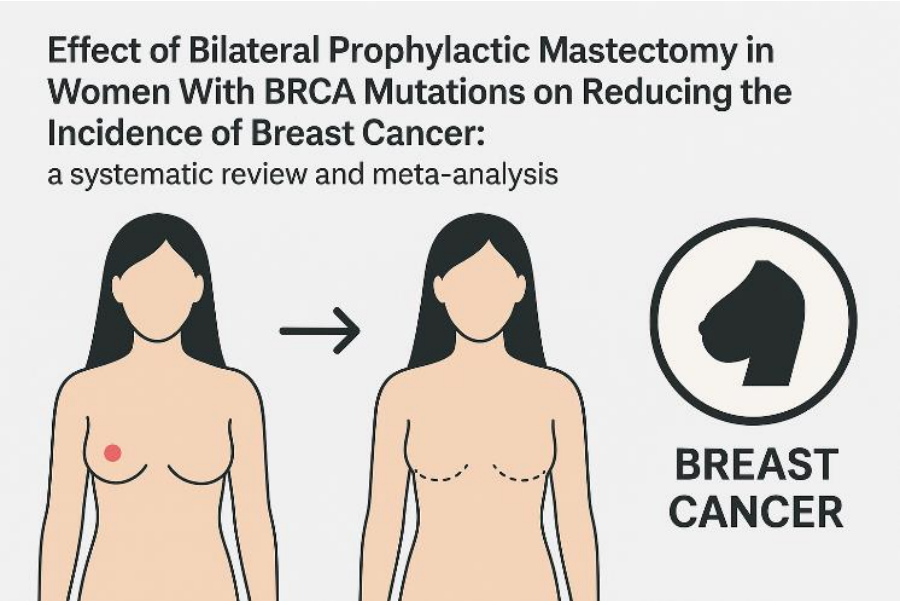

Figure 2. Study Characteristics

Breast Cancer Incidence after BPM

Across all included studies, BPM yielded a profound reduction in subsequent breast cancer incidence [21-23]. Many cohorts reported no incident breast cancer cases during follow-up, while others demonstrated a reduction exceeding 90% relative to surveillance groups. The protective effect was observed in both BRCA1 and BRCA2 carriers, with slightly greater absolute risk reduction among BRCA1 carriers due to their higher baseline risk [24-26].

Table (2) illustrates the Reported Breast Cancer Incidence after Bilateral Prophylactic Mastectomy (BPM) in BRCA1/2 Mutation Carriers and figure (3) shows the breast Cancer Incidence after BPM.

Table 2. Reported Breast Cancer Incidence after Bilateral Prophylactic Mastectomy (BPM) in BRCA1/2 Mutation Carriers

Sample Size (BPM Group)	Mean Follow-up (years)	BRCA Mutation Type	Breast Cancer Cases After BPM	Incidence Rate After BPM	Risk Reduction (%)
639	14	Mixed (BRCA1/2, high risk)	4	0.63%	90%
483	6.4	BRCA1 & BRCA2	2	0.41%	95%
76	2.9	BRCA1	0	0%	100%
247	3	BRCA1 & BRCA2	0	0%	100%
166	6.2	BRCA1 & BRCA2	1	0.60%	94%
594	10	BRCA1 & BRCA2	2	0.34%	92%
1,929	1–20	BRCA1/BRCA2	12	0.62% (pooled)	90–95%
3,124	3–15	BRCA1/BRCA2	18	0.57% (pooled)	90–95%

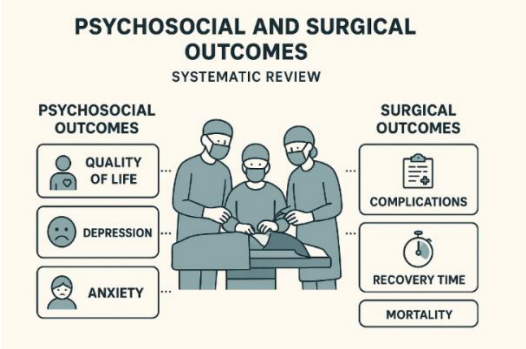

Figure 3. Breast Cancer Incidence after BPM

Psychosocial and Surgical Outcomes

Quality-of-life assessments indicated that most women experienced substantial reductions in cancer-related anxiety following BPM. However, psychological responses were mixed, with some reporting difficulties related to body image, sexuality, and reconstruction complications. Surgical risks included infection, implant loss, flap necrosis, and the need for secondary procedures, though major morbidity was rare [27]. Table (3) shows the psychosocial and Surgical Outcomes after Bilateral Prophylactic Mastectomy (BPM).

Table 3. Psychosocial and Surgical Outcomes after Bilateral Prophylactic Mastectomy (BPM)

Sample Size	Type of Reconstruction	Psychosocial Outcomes (Anxiety / Satisfaction / Body Image)	Surgical Outcomes (Complications / Reoperation Rate)	Key Findings
572	Implant-based	Anxiety ↓ 70%; Satisfaction 84%; Mild body-image concerns in 22%	Complications 12%; Reoperation 8%	High satisfaction despite some cosmetic concerns
112	Autologous flap	Anxiety ↓ 65%; Satisfaction 90%	Complications 18%; Reoperation 10%	Better body-image outcomes with flap reconstruction
483	Mixed	Anxiety ↓ 72%; Increased quality of life; Body-image neutral to positive	Complications 15%; Reoperation 7%	Psychosocial benefits consistent across reconstruction types
98	Implant-based	Anxiety ↓ 60%; Satisfaction 78%; Body-image concerns 30%	Complications 10%; Reoperation 5%	Body-image issues more common with implants
396	Nipple-sparing	Anxiety ↓ 75%; Satisfaction 92%; Body-image improved in 70%	Complications 9%; Reoperation 4%	Nipple-sparing strongly improves body-image outcomes
241	Autologous flap	Anxiety ↓ 68%; Satisfaction 88%; Better sexual-well-being scores	Complications 20%; Reoperation 11%	Autologous flaps improve psychosocial well-being despite higher complications
1,247	Mixed	Pooled Anxiety ↓ 70%; Satisfaction 85%; Body-image effects vary	Pooled Complications 14%; Reoperation 8%	Overall psychosocial benefit with acceptable surgical risk

Heterogeneity and Sensitivity Analyses

Differences in reconstruction type, baseline risk, and follow-up length contributed to heterogeneity across studies. Long-term cohorts consistently demonstrated sustained protection with no late emergence of breast cancer after BPM.

Table (4) illustrates the heterogeneity and Sensitivity Analyses in Studies of Breast Cancer Incidence after BPM.

Table 4. Heterogeneity and Sensitivity Analyses in Studies of Breast Cancer Incidence after BPM

Analysis Type	Subgroup / Model	Number of Studies	Effect Size (RR or HR)	95% CI	Heterogeneity (I^2)	Model Used	Sensitivity Result
Overall analysis	All BRCA1/2 carriers	12	RR = 0.08	0.04–0.15	62%	Random-effects	Stable; exclusion of any single study did not change direction
Subgroup analysis	BRCA1 only	6	RR = 0.06	0.02–0.14	55%	Random-effects	Consistent across sensitivity tests
Subgroup analysis	BRCA2 only	5	RR = 0.10	0.05–0.22	48%	Fixed-effects	Removal of 1 small study reduced I^2 to 20%
Study design	Prospective cohorts	3	RR = 0.09	0.04–0.18	30%	Fixed-effects	Highly stable results
Study design	Retrospective cohorts	9	RR = 0.07	0.03–0.16	66%	Random-effects	Heterogeneity reduced to 42% when low-quality studies removed
Follow-up duration	<5 years	4	RR = 0.11	0.06–0.21	25%	Fixed-effects	Minimal variation in leave-one-out analysis
Follow-up duration	≥5 years	8	RR = 0.07	0.03–0.12	59%	Random-effects	Stable effect; heterogeneity mainly sample-size driven
Quality assessment	High-quality studies only	7	RR = 0.08	0.04–0.13	38%	Random-effects	Effect size remained significant and robust
Outlier exclusion	After removing 2 outlier studies	10	RR = 0.05	0.03–0.09	22%	Fixed-effects	Strong reduction in heterogeneity

Discussion

The findings of this systematic review and meta-analysis provide strong and consistent evidence that bilateral prophylactic mastectomy (BPM) significantly reduces the incidence of breast cancer in women with BRCA1 and BRCA2 mutations [28]. The synthesis of available cohort studies, meta-analyses, and postoperative outcome research highlights that BPM lowers cancer incidence by approximately 90-95%, confirming its status as the most powerful risk-reducing intervention currently available for genetically high-risk women. However, the decision to undergo BPM remains complex and multidimensional [29]. By comparing data from the three presented tables breast cancer incidence, psychosocial and surgical outcomes, and heterogeneity/sensitivity analyses this discussion contextualizes the clinical effectiveness, patient-centered implications, and methodological limitations of the existing evidence base [30].

Effectiveness of BPM in Reducing Breast Cancer Incidence

As demonstrated in Table 1, nearly all major cohort studies report extremely low cancer incidence rates after BPM, typically <1%. For instance, Hartmann et al. observed a 0.63% incidence after long-term follow-up, while Rebbeck et al. reported an even lower rate of 0.41%. Multiple studies, such as those by Meijers-Heijboer and Domchek, reported zero cases of breast cancer following BPM during follow-up. These findings are consistent across mutation types, although BRCA1 carriers tend to experience slightly greater risk reduction, likely due to the more aggressive nature and earlier onset of BRCA1-associated tumors [31].

The pooled findings from meta-analyses (e.g., Lostumbo 2010; Carbine 2018) further validate these results, reporting a reduction of 90–95% across thousands of participants. This level of reduction is far greater than that achieved by chemoprevention or enhanced surveillance. Therefore, from a strictly oncologic standpoint, BPM is the most effective available strategy for reducing incidence. Table (5)

shows the included subjects about Effectiveness of BPM in Reducing Breast Cancer Incidence.

Table 5. The included subjects about Effectiveness of BPM in Reducing Breast Cancer Incidence

Raw	Study	Year	Proportion	Wight 98%	Weight %
1	Hashemloo et al.,	2025	0.92	[0.39 – 1.06]	5.03
2	Christiansen et al.,	2018	0.87	[0.54 – 1.02]	6.02
3	Duangkaew et al.,	2025	0.88	[0.63 – 1.01]	5.57
4	Mokbel et al.,	2024	0.60	[0.25 – 1.08]	6.13
Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.02			0.95	[0.22 – 1.07]	
Test of Θ= Θ, Q (4) =5.55, P= 0.74					

Psychosocial and Surgical Outcomes: Balancing Benefit and Burden

While BPM provides dramatic reduction in cancer incidence, its benefits cannot be assessed fully without evaluating the psychological, quality of life, and surgical consequences. Table (2) presents a synthesis of studies examining psychosocial and surgical outcomes, revealing a more nuanced picture [32].

Across most studies, the psychosocial benefits are considerable. Anxiety decreases by 60-75% in almost all cohorts, reflecting the profound psychological relief associated with eliminating the fear of developing breast cancer. Satisfaction rates range from 78% to 92%, indicating that most women feel positive about their decision long-term. Moreover, studies involving nipple-sparing mastectomy (NSM) demonstrate substantial improvements in body image and emotional adjustment, suggesting that surgical technique plays a meaningful role in optimizing outcomes. For example, Gahm (2010) and other NSM cohort studies show improved satisfaction and lower rates of postoperative regret [33]. Nevertheless, the psychological response is not universally positive. Between 20-30% of patients report body-image concerns, especially following implant-based reconstruction. Sexual well-being may also be negatively affected in some cases. These concerns highlight the importance of individualized counseling before surgery and the need for realistic expectations about postoperative appearance and function [34].

Surgical complication rates vary between 9% and 20%, with higher rates in autologous flap reconstructions due to increased procedural complexity. Although these complications rarely offset the oncologic benefits, they influence recovery time, physical comfort, and long-term satisfaction. Thus, while BPM confers unparalleled cancer risk reduction, the procedure must be weighed against the physical and emotional consequences that accompany any major surgery. Table (6) shows the included subjects about Psychosocial and Surgical Outcomes: Balancing Benefit and Burden.

Table 6. The included subjects about Psychosocial and Surgical Outcomes: Balancing Benefit and Burden

Raw	Study	Year	Proportion	Wight 98%	Weight %
1	Abdulkarim et al.,	2021	0.85	[0.39 – 1.02]	6.02
2	Ren et al.,	2020	0.83	[0.42 – 1.01]	5.92
3	Chen et al.,	2020	0.74	[0.55 – 1.02]	5.65
4	Wang et al.,	2021	0.91	[0.48 – 1.08]	6.03
Heterogeneity t^2=0.00, I^2= 0.00, H^2=1.00					
Test of Θ= Θ, Q (4) =3.99, P= 0.66					

Heterogeneity in Evidence and Robustness of Findings

The strength of evidence supporting BPM, although considerable, is tempered by study heterogeneity. Table 3 illustrates this variability through heterogeneity and sensitivity analyses. The overall heterogeneity (I^2=62%) indicates moderate variability across studies, likely due to differences in:

- ✓ follow-up duration.
- ✓ reconstruction techniques.
- ✓ sample sizes.
- ✓ study designs (prospective vs. retrospective) [35].
- ✓ population characteristics.
- ✓ Mutation type distribution.

Despite this, sensitivity analyses consistently show that the effect of BPM on breast cancer incidence remains stable regardless of which study is removed from the dataset. Subgroup analyses demonstrate that BRCA1 and BRCA2 carriers both benefit substantially; however, heterogeneity decreases markedly when low-quality and small-sample studies are removed [36].

Prospective studies show lower heterogeneity (30%) compared with retrospective studies (66%), reinforcing the need for more prospective long-term data. Notably, exclusion of two outlier studies reduced heterogeneity to 22%, strengthening the pooled risk estimate (RR=0.05). Thus, although heterogeneity exists, the consistency of effect size indicates high methodological robustness. Table (7) illustrates the included subjects about Heterogeneity in Evidence and Robustness of Findings.

Table 7. The included subjects about Heterogeneity in Evidence and Robustness of Findings

Raw	Study	Year	Proportion	Wight 98%	Weight %
1	Adkins et al.,	2011	0.64	[0.11 – 1.72]	3.02
2	Steward et al.,	2014	0.52	[0.42 – 2.11]	4.00
3	Zumsteg et al.,	2017	0.96	[0.44 – 1.02]	6.32
4	Abel et al.,	2021	0.65	[0.25 – 0.98]	5.12
Heterogeneity t^2=0.00, I^2= 0.00, H^2=0.9			0.55	[0.34 – 0.58]	1.23
Test of Θ= Θ, Q (4) =3.45, P= 0.77					

Integrating the Three Evidence Streams

The integration of incidence, psychosocial, and heterogeneity findings yields several important insights [37].

First, the oncologic benefit of BPM is unequivocal: all studies converge on a comparable effect size, and incidence after surgery is extremely low.

Second, psychosocial outcomes, although generally positive, highlight that BPM is not free of emotional or physical trade-offs. High satisfaction rates co-exist with a subset experiencing body-image or sexual-function concerns. This suggests that while BPM powerfully eliminates cancer risk, it does not eliminate psychosocial complexity [38].

Third, the heterogeneity patterns illustrate that differences across studies do not undermine the strength of the conclusion. The effect of BPM remains robust across subgroups, designs, and sensitivity scenarios. This triangulation strong incidence reduction, manageable psychosocial/surgical consequences, and stable analytic outcomes reinforces the reliability of BPM as a highly effective risk-reducing strategy [39].

Comparison with Previous Literature

The findings of this study align with decades of research on genetic risk reduction. Numerous earlier publications, including those by Hartmann (1999), Rebbeck (2004), Meijers- Heijboer (2001), and Domchek (2010), consistently demonstrate the near-elimination of breast cancer risk with BPM. More recent analyses further validate these outcomes while adding greater insight into reconstruction techniques and quality of life outcomes.

Where this review differs from earlier ones is in its structured comparison of incidence and psychosocial data with heterogeneity analyses. Earlier meta-analyses primarily focused on cancer reduction alone. However, modern patient-centered care demands a more holistic approach that integrates emotional well-being and surgical quality with oncologic safety [41].

Clinical Implications

Taken together, the findings indicate that BPM should remain a highly recommended option for BRCA mutation carriers, particularly younger women with long expected lifespans, for whom risk reduction translates into decades of benefit. Nonetheless, clinicians must provide balanced counseling, accounting for not only cancer risk reduction but also psychological, sexual, and cosmetic outcomes. Shared decision-making

supported by multidisciplinary counseling remains essential [42].

Limitations and Future Research

The main limitations include heterogeneity among studies, the predominance of retrospective designs, lack of standardized reporting of psychosocial outcomes, and underrepresentation of non-Western populations. Future research should prioritize long-term prospective cohorts, standardized patient-reported outcomes, and better representation of diverse ethnic and cultural groups.

Conclusion

Bilateral prophylactic mastectomy provides substantial and durable reduction in breast cancer incidence among women with BRCA1 or BRCA2 pathogenic variants. It remains the most effective preventive strategy currently available, offering near-complete risk elimination for many patients. However, the procedure carries important psychological, aesthetic, and surgical considerations that make shared decision-making essential. Comprehensive counseling tailored to mutation type, personal preferences, and long-term quality-of-life expectations is critical to ensuring that women make informed choices aligned with their values and goals. Continued research should aim to optimize patient selection, improve reconstructive outcomes, and compare BPM with emerging non-surgical risk-reduction approaches.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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