

The impact of prophylactic mastectomy on sexual well-being: a systematic review

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Abstract

Introduction: Considering the increasing women's awareness of health promotion and disease prevention programs, mutation carriers are inevitably asked to face important decisions concerning the possibility of undergoing prophylactic mastectomy. Risk-reducing mastectomy (RRM) has become increasingly more common, although it has a significant impact on women's quality of life and sexual well-being.

Objectives: The systematic review aims to evaluate the impact of RRM on the sexuality of women with breast cancer.

Methods: According to Cochrane Collaboration guidelines and the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement, the study quantified the effects of frontline work on the mental health of healthcare workers. This review followed the PRISMA guidelines. Three databases were systematically searched from inception to December 2022. The expression ("sexuality" OR "sexual" OR "sex") AND ("prophylactic mastectomy" OR "risk-reducing mastectomy") was searched in PubMed, Ovid Medline, and Embase. Twenty-two articles published in English until 2022 were selected.

Results: Two studies investigated sexual experience after risk-reducing surgeries as a single outcome, while other studies analyzed the relationship between sexuality and psychosocial outcomes, risk perception, and satisfaction. In all of the included studies, significant findings in sexual dysfunction were found. The most reported problems were related to sexual satisfaction and attractiveness, body image, and loss of femininity. Last, women reported changes in the relationship with their partners.

Conclusion: RRM has a major impact on body image that affects sexual functioning and quality of life. These implications must be considered during treatment selection.

Keywords: breast cancer; sexual well-being; psychological well-being; risk-reducing mastectomy; body image.

Introduction

Breast cancer is the most common form of cancer among women, with significant morbidity and mortality.¹ In Italy, the incidence of breast cancer in 2021 was estimated at around 55 700 new diagnoses, being the most frequently diagnosed of any other type of cancer.¹ Considering women's increasing awareness of health promotion and disease prevention programs, in recent years preventive actions have been raised. Among these, the role of genetic testing in identifying the risk for hereditary breast and ovarian cancer has recently increased.² Identification of germline mutations in high-risk carriers provides useful information of prognostic and predictive value and allows for increased surveillance and earlier implementation of risk-reducing strategies.^{3,4}

At present, genetic tests have enabled practitioners to assess the risk of developing breast cancer by identifying specific genetic mutations associated with its increment.

As a consequence, mutation carriers are inevitably asked to face important decisions concerning, among other options, the possibility of undergoing prophylactic mastectomy. Risk-reducing mastectomy (RRM) has become increasingly more common, although it has a significant impact on women's quality of life.⁵ Indeed, it is a substantial and irreversible procedure and it is not risk-free.⁶

Research shows that surgical prophylactic interventions reduce the risk of manifesting breast cancer,⁷ but such treatments may heavily affect the person's psychological and sexual well-being.^{8–11} Many relevant changes occur, specifically regarding body image,^{9,11,12} loss of haptic perception,^{10,13} and consequent alteration of tactile stimulation.¹⁴ Moreover, losing a part of or whole breast tissue as a secondary sex organ can determine alterations in gender identity and cause a variety of subjective reactions in the sexual domain.^{15,16}

Sexual dysfunction in breast cancer patients is assumed to be common^{17,18} but understudied,^{8,16} and indeed, sexual issues usually go unaddressed. What is known from the scientific literature is that breast-conserving surgical treatments seem to be associated with better sexual functioning and fewer body image issues.¹⁹ On the other hand, RRM is a preventive intervention and carries different implications in women's life in terms of body perception and psychosexual burden.^{12,20} Despite the relevance of this issue and the increasing number of studies investigating these aspects, the current scientific literature lacks a combined overview. To offer the best consultation, it becomes significant to be aware of the impact of a prophylactic mastectomy on sexual life.

The present work will aim to conduct a systematic review of sexual well-being after contralateral prophylactic mastectomy in breast cancer patients.

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Methods

The procedure has been conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement.²¹ It was conducted an electronic search on the major databases in the field to include the broadest range of relevant literature on health and social sciences: Embase, Ovid, and PubMed.

The search was conducted from inception to December 2022 using MeSH (Medical Subject Headings) terms/keywords (depending on the database) with the same search strategy: (“sexuality” OR “sexual” OR “sex”) AND (“prophylactic mastectomy” OR “risk-reducing mastectomy”). The search included articles published in English that evaluated sexual issues in women with breast cancer undergoing an RRM.

The inclusion criteria were articles published in English, availability of full text, and discussion of sexual issues in women with cancer receiving preventive breast surgery. The articles not fulfilling the inclusion criteria were excluded.

A total of 1289 articles were found. Study selection was performed by 2 independent reviewers with research expertise in general and clinical psychology (L.S. and S.P.), who assessed the articles according to their relevance to the objectives of this review. Disagreements between reviewers were resolved by a process of discussion/consensus moderated by a third reviewer (C.M.).²²

After the initial step of identification of records through different databases and duplicate removal, the following phase (screening) consisted of the selection of articles based on the title, abstract, and keywords of each study. The full text was removed if the reviewers did not reach a consensus or if the abstract did not contain sufficient information. In the phase of eligibility, all full texts were retrieved and a final check was done to exclude articles not responding to inclusion/exclusion criteria. A final consensus to decide the inclusion in the last selection was taken. A standardized data extraction form was prepared and relevant information was summarized.

A total of 22 articles were selected. The flow chart of the selection process is reported in [Figure 1](#).

Quality assessment

A checklist developed by Downs and Black²³ was used to assess the methodological quality of both randomized and nonrandomized studies of healthcare interventions.

The checklist consists of 27 items, staggered in 5 subscales that measure quality of reporting, internal validity (bias and confounding), power, and external validity, to obtain 5 respective subscores and a total quality index score. In addition, a global item is included at the end of the checklist to register the raters' overall impression of the quality of the article assessed.

The quality assessment was carried out by 3 authors (L.S., S.F.M.P., C.M.), and disagreements were resolved by discussion until reaching a consensus.

Results

Study characteristics

Study characteristics were all reported in [Table 1](#) and divided into the following identified categories: author name, year of publication, country where the study was conducted, study design, sample, median of sample age, measured outcomes and the related tools, and assessment time points (see [Table 1](#)).

The included studies were conducted between 2000 and 2022; 5 studies were conducted in America, 15 in Europe, and 2 in Oceania. A total of 22 studies were included in the systematic review, of which 19 were quantitative studies (9 longitudinal and 8 cross-sectional study designs), 3 were qualitative,²⁴⁻²⁶ and 2 were mixed-methods.^{27,28}

Ten studies were conducted on healthy women undergoing prophylactic surgery,^{14,25,26,28-34} while 5 included only participants at high risk with previous cancer diagnosis.^{16,24,27,35,36} The remaining studies included a mixed sample. All study participants had an overall median age of 44.15 years.

Sexual measurement tools

Two studies^{16,27} investigated sexual experience after risk-reducing surgeries as a single outcome, while other articles analyzed the relationship between sexuality and other psychosocial, risk perception, satisfaction, and quality of information provision variables. More specifically, the most collected outcomes were body image,^{25,28-30,32-41} anxiety and depression symptoms,^{26,28,30,34,36,38,42,43} and information provision.^{25,26,37-41} Three studies investigated not only women's status, but also partner's relationship.^{29,32,39}

Sexual function has been investigated both with semi-structured interviews^{24,28} and with validated tools. The most used questionnaires to assess sexual outcomes were the Sexual Activity Questionnaire,^{28,30,33,36,43} BREAST-Q Postoperative Reconstruction Module,^{27,37,38,40} and Female Sexual Function Index.^{16,42} Other studies used ad hoc questions to investigate sexual intimacy,³⁹ role, and discomfort of the chest in intimacy.^{14,31,42}

Sexual outcomes

The study results related to sexual outcomes are reported in [Table 2](#).

In all of the included studies, significant findings in sexual dysfunction were found. The most reported problems were related to sexual satisfaction/enjoyment,^{14,16,35,42} sexual and physical attractiveness,^{29,34,41} and loss of perceived femininity/sensuality.^{34,41,42}

If investigated, women reported changes in the relationship with their partners, by highlighting sexual distance²⁴ and discomfort in being naked with them after surgery.^{25,39} Other studies reported disappointment in the relationship^{29,32} and the need for greater partner involvement to analyze expectations about sexuality.^{26,27} Moreover, the need for better information provision about sexual outcomes after surgery emerged in 2 studies.^{27,41}

Sexual well-being was associated with body image perception,^{25,27,28,30,33,41,43} anxiety and depression symptoms,^{38,42} age,^{37,40} pain,^{16,25,41} and surgical complications.⁴⁰

Breast reconstruction was related to self and sexual identity,²⁴ frequency and quality of sexual intercourse,³⁹ and discomfort after surgery.²⁵

Quality assessment results

Downs and Black's methodological quality scale²³ is a checklist used to assess the methodological quality of randomized and nonrandomized studies. It is composed of 27 questions, grouped between 5 dimensions: reporting (9 items), external validity (3 items), bias (7 items), confounding (6 items), and power (1 item). Such a measure allows us to obtain a total

Table 1. Study characteristics

Study	Publication year	Country	Study design	Sample	Mean age (y)	Measured outcomes	Measurement tools	Assessment time points
Michałowska et al [29]	2022	Poland	Cross-sectional study	310 healthy women: 55 RRM 51 RR adnexectomy 40 both surgeries 164 no surgeries	50	Body assessment Partner satisfaction Sexual satisfaction	Self-esteem: BES (subscales: sexual attractiveness, weight control, physical condition) Matched marriage: KDM-2 Sexual satisfaction: SSS-WR15	T0: after surgery
García-Solbas et al [37]	2021	Spain	Cross-sectional study	50 women undergoing bilateral/unilateral RRM + reconstruction	46	Physical well-being Psychosocial well-being Satisfaction with breast information/staff Satisfaction with outcomes	BREAST-Q (Reconstruction)	T0: after surgery
Gandhi et al [38]	2021	United Kingdom	Longitudinal study	297 women undergoing bilateral RRM after cancer (cancer group) or benign findings (benign group); 128 patients completed HADS	42.7	Sexual well-being Physical well-being Psychosocial well-being Satisfaction with breast information/staff Satisfaction with outcomes Anxiety and depression	BREAST-Q (Reconstruction) HADS	T0: preoperative psychological consultation (HADS) T1: after surgery + reconstruction (BREAST-Q) BREAST-Q compared between cancer group and benign group T0: postsurgery T1: 3 y after surgery T2: 12 y after surgery T0: 6 y after HBOC syndrome diagnosis
Dijkmans et al [27]	2019	The Netherlands	Mixed-methods longitudinal study	10 women undergoing RRM + reconstruction	46	Postoperative sexuality	Semi-structured interviews BREAST-Q (Reconstruction)	
Modaffari et al [39]	2019	Italy	Cross-sectional study 2 groups: (1) healthy women with BRCA mutation or high familial risk (2) women with previous breast cancer or ovarian cancer	204 women undergoing RRM + reconstruction (1) 104 healthy (2) 100 previous breast cancer or ovarian cancer	47	Knowledge and concerns about (1) RRS, postoperative complications and late effects (2) Screening procedures for breast cancer and ovarian cancer (3) Role of their partner in the decision making on RRS (4) Satisfaction on given information on RRM surgical procedure, cosmetic and tactile sensation of reconstructed breasts (5) Influence of RRM on body appearance and sexual intimacy (6) Satisfaction on given information on RRSO and menopausal symptoms and its possible treatments	40-items ad hoc questionnaire	

(Continued)

Table 1. Continued

Study	Publication year	Country	Study design	Sample	Mean age (y)	Measured outcomes	Measurement tools	Assessment time points
Rojas et al [42]	2019	United States	Cross-sectional study 2 groups: (1) mBRCA with breast cancer: mastectomy or lumpectomy (2) mBRCA without breast cancer: bilateral RRM + reconstruction or high-risk screening Qualitative study	63 women: 31 with breast cancer 32 without breast cancer	54	Sexual function Anxiety and depression	FSFI HADS Ad hoc questions on: Demographic information Cancer treatments Role of the chest in intimacy Perception of pleasurable caress before and after surgery	T0: after mBRCA diagnosis
Bloom et al [24]	2019	United States	Qualitative study	45 women undergoing contralateral RRM after early-stage breast cancer	47	Decision making and impact of contralateral RRM on: Self-confidence Sense of femininity Sexual intimacy Peace of mind Physical well-being Psychosocial well-being Satisfaction with breast information/staff Satisfaction with outcomes Sexual well-being HRQoL Anxiety and depression Sexuality Body image Sexual function	In-depth semi-structured interviews analyzed through thematic analysis using NVivo	T0: after surgery (surgery from 1 to 10 y ago)
Kazzazi et al [40]	2018	United Kingdom	Cross-sectional study 3 groups: (1) bilateral therapeutic mastectomy (2) bilateral RRM (3) therapeutic + contralateral RRM Longitudinal study	57 women: 9 bilateral therapeutic mastectomy 29 bilateral RRM 19 therapeutic + contralateral RRM	45 overall (no separate data)	Sexual well-being HRQoL Anxiety and depression Sexuality Body image Sexual function	BREAST-Q (Reconstruction)	T0: after surgery
Unukovych et al [43]	2017	Sweden	2 groups: (1) bilateral RRM (2) contralateral RRM Longitudinal study	253 women	44	Sexual well-being HRQoL Anxiety and depression Sexuality Body image Sexual function	SF-36 HADS SAQ BIS (only before RRM) FSFI	T0: presurgery (222 patients) T1: 2 y after surgery (179 patients) T0: at diagnosis T1: most recent follow-up completed Questionnaire (median time to follow-up: 13 mo)
Cornell et al [16]	2017	United States	3 groups: (1) women undergoing breast-conserving surgery (2) women undergone UM (3) women undergone UM plus contralateral RRM (UM + RRM) Longitudinal study	226 women with breast cancer: 119 breast-conserving surgery 40 UM 67 UM + RRM	48	Perceived breast and ovarian cancer risk Psychological well-being (anxiety and depression, cancer-related anxiety, body image, sexual functioning, menopausal symptoms, decision regret)	0-100 Likert scales to measure: Perception of breast and ovarian cancer risk Perception of lifetime risks HADS IES (thoughts subscale) BIS Body image dysphoria: SIBID SAQ Menopause: MRS Decision regret: DRS	T0: psychosocial assessment before surgery T1: 3 mo after T0 (in the control group) of the control group) of after surgery
Heiniger et al [30]	2015	Australia	Longitudinal study	233 healthy women: (1) 70 surgery group (17 RRM, 38 RRSO, 15 both) (2) 163 no surgeries (39 RRM, 94 RRSO, 30 both)	47	Perceived breast and ovarian cancer risk Psychological well-being (anxiety and depression, cancer-related anxiety, body image, sexual functioning, menopausal symptoms, decision regret)	0-100 Likert scales to measure: Perception of breast and ovarian cancer risk Perception of lifetime risks HADS IES (thoughts subscale) BIS Body image dysphoria: SIBID SAQ Menopause: MRS Decision regret: DRS	T0: psychosocial assessment before surgery T1: 3 mo after T0 (in the control group) of the control group) of after surgery

(Continued)

Table 1. Continued

Study	Publication year	Country	Study design	Sample	Mean age (y)	Measured outcomes	Measurement tools	Assessment time points
Gahm et al [31]	2013	Sweden	Longitudinal study	46 healthy women undergoing bilateral RRM + immediate reconstruction	39	Breast sensitivity Nipple sensitivity Subjective and sexual feelings in the reconstructed breasts (only at T1)	Quantitative sensory testing on touch, cold, warmth, and heat pain Study-specific questionnaire on subjective feelings in the reconstructed breasts on sensation on the nipple, touch on the breast skin, cold, warmth, pain on the breast skin, sexual sensations in the breast with Likert scale from 1 (no sensation) to 7 (unchanged sensation)	T0: presurgery T1: at least 2 y after surgery (median 29 mo)
Gopie et al [32]	2013	The Netherlands	Longitudinal study	48 healthy women undergoing bilateral RRM + reconstruction	37	Body image Sexuality Satisfaction with the sexual relationship Satisfaction with the overall partner relationship General physical and mental health Breast cancer-specific distress	BIS Dutch Relationship Questionnaire (NRV), SF-36 IES	T0: presurgery T1: 6 mo after bilateral RRM T2: after completing breast reconstruction
Hallowell et al [25]	2012	Australia and New Zealand	Qualitative study	40 healthy women: (1) 19 RRSO (2) 8 RRM (3) 13 both	34	Psychosocial impact of surgery (surgical decision making, information needs, perceived costs and benefits of surgery, risk perception, presurgery expectations and knowledge, experiences of surgery and convalescence, menopause and HRT use, and overall satisfaction with the surgical decision, feeling and looking different)	Semi-structured interview	T0: telephone interview 3 y after surgery
Unukovych et al [36]	2012	Sweden	Longitudinal study	60 cancer women undergoing contralateral RRM + reconstruction	45	HRQoL Anxiety and depression Body image Sexuality	SF-36 HADS BIS SAQ	T0: presurgery T1: 6 mo after surgery T2: 2 y after surgery

(Continued)

Table 1. Continued

Study	Publication year	Country	Study design	Sample	Mean age (y)	Measured outcomes	Measurement tools	Assessment time points
Gahm et al [14]	2010	Sweden	Longitudinal study	59 healthy women undergoing bilateral RRM + reconstruction	—	HRQoL Pain and discomfort in the breasts Sexuality Regret	SF-36 DRS Ad hoc questionnaire on pain and discomfort in the breasts and sexuality	T0: after minimum of 2 y after BPM T1: at least 1 y after any corrective procedure
Bresser et al [41]	2006	The Netherlands	Cross-sectional study	114 women undergoing RRM (bilateral or contralateral) + reconstruction	44	Satisfaction with surgery, information, complications Physical complaints, body image, sexuality	Ad hoc questionnaire on: (1) general and prophylactic mastectomy/breast reconstruction-specific satisfaction (2) feeling informed about the procedure and its possible consequences (3) perioperative and postoperative complications, physical complaints, and limitations attributable to prophylactic mastectomy/breast reconstruction (4) effects on body image and sexuality	T0: after surgery (median follow-up time between breast cancer and completion of the questionnaire was 3 y)
Geiger et al [35]	2006	United States	Cross-sectional study	519 women with contralateral RRM after breast cancer 61 women without contralateral RRM after breast cancer	50	Depression Quality of life and sexual satisfaction Satisfaction with the procedure Breast cancer thoughts Body image Health perception	Depression: CES-D Quality of life and sexuality: 2 items from the FACT (breast) Satisfaction with RRM and breast cancer concern: 1 ad hoc item Avoiding thoughts/intrusive breast cancer thoughts: 2 items from the revised IES Body image: 4 ad hoc items Health perception: 1 item from the Medical Outcomes Study Short Form-36	T0: after surgery
Metcalfe et al [33]	2004	Canada	Cross-sectional study	60 healthy women undergoing bilateral RRM 63.3% had breast reconstruction	43.5 at surgery 47.8 at questionnaire completion	Overall satisfaction with decision to have an RRM Body image Psychological distress Sexual activity	Ad hoc satisfaction questionnaire Body image: BIBC Psychological distress: BSI, IES, SAQ	T0: after surgery (52.2 mo between surgery and T0)

(Continued)

Table 1. Continued

Study	Publication year	Country	Study design	Sample	Mean age (y)	Measured outcomes	Measurement tools	Assessment time points
Hatcher et al [26]	2003	United Kingdom	Qualitative study	80 healthy women undergoing bilateral RRM: (1) 60 accepters of RRM without reconstruction (2) 20 decliners of RRM	40	Anxiety Surgery Reconstruction Sexual impact Information Gene testing Support	Semi-structured interview	Accepters: T0: presurgery T1: 6 mo after surgery T2: 18 mo after surgery Decliners: T0: initial interview T1: 18 mo after T0
Hatcher et al [28]	2001	United Kingdom	Mixed-methods longitudinal study 2 groups: (1) BPM accepters (2) BPM decliners	143 healthy women undergoing bilateral RRM: (1) 79 accepters with or without reconstruction (2) 64 decliners	38	General health Anxiety Sexual activity Coping mechanism Risk perception Body image	Semi-structured interview: decision making, perceptions of risk, and psychosocial implications of surgery General Health: GHQ STAI SAQ (discomfort and pleasure subscale) Coping: WCC Ad hoc risk perception questionnaire BIS	T0: before accepting or declining RRM T1: 6 mo after T0 T2: 18 mo after T0
Hopwood et al [34]	2000	United Kingdom	Longitudinal study	49 healthy women undergoing bilateral RRM with or without reconstruction	40	Mental health Body image Breast cancer worry	GHQ (subscales: somatic complaints, anxiety, social function and depression) BIS Lerman's Cancer Worry Scale	T0: at surgery T1: 6-18 mo from T0 T2: 19-30 mo from T0 T3: 31-42 mo from T0

Abbreviations, BES, Body Esteem Scale; BIBC, Body Image after Breast Cancer; BIS, Body Image Scale; BPM, Bilateral Prophylactic Mastectomy; BSI, Brief Symptom Inventory; CES-D, Center for Epidemiologic Studies-Depression; DRS, Decision Regret Scale; FACT, Functional Assessment of Cancer Therapy; FSFI, Female Sexual Function Index; GHQ, General Health Questionnaire; HADS, Hospital Anxiety and Depression Scale; HBOC, hereditary breast and ovarian cancer syndrome; HRQoL, health-related quality of life; HRT, Hormone Replacement Therapy; IES, Impact of Event Scale; KDM-2, Matched Marriage Questionnaire; mBRCA, mutation breast cancer; MRS, Menopause Rating Scale; NRV, Dutch Relationship Questionnaire; QoL, quality of life; RRM, risk-reducing mastectomy; RRS, Risk-reducing surgery; RRSO, risk-reducing oophorectomy; SAQ, Sexual Activity Questionnaire; SF-36, 36-item Short-Form Health Survey; SIBID, Situational Inventory of Body Image Dysphoria; SSS-WR15, Women's Sexual Satisfaction Scale; STAI, State-Trait Anxiety Inventory; T, time; UIM, unilateral mastectomy; WCC, Ways of Coping Questionnaire.

Table 2. Study results

Study	Publication year	Results
Michalowska et al [29]	2022	Older women reported higher levels of intimacy, self-fulfillment, similarity, and disappointment in a partner relationship. Women undergoing mastectomy showed lower results in sexual attractiveness and in satisfaction with sexual activity. Women after both procedures showed lower sexual matching than women who had not undergone any surgery. Women with a family history of breast cancer, ovarian cancer, or both showed similar levels of sexual attraction to those who had no family history of the disease.
García-Solbas et al [27]	2021	Sexual satisfaction was the lowest score of the entire questionnaire.
Gandhi et al [28]	2021	Sexual well-being had an inverse correlation with patient's age.
Dikmans et al [27]	2019	The cancer group had lower scores than the benign group in satisfaction with their breasts and sexual well-being. Higher anxiety associated with a less favorable outcome on the BREAST-Q examining postoperative psychosocial well-being. Difficulties with sexuality on body image, disappointing aesthetics and sensation outcomes, and partner relationship issues. Need for creating realistic expectations and information pertaining to sexuality.
Modaffari et al [39]	2019	The partner should be more involved and informed about expectations on outcomes and sexuality. BREAST-Q (sexual well-being subscale): scores from 39 to 100 (mean = 46) About one-third of the responders reported that their intimate relationship was influenced by RRM: 35.5% felt discomfort in being naked with their partner after surgery and 29.0% the procedure had an adverse influence on their sexuality.
Rojas et al [42]	2019	Regarding RRM, women with previous breast cancer were less satisfied with the feeling of the reconstructed breasts and reported a greater change in their sexuality, particularly in the frequency of intercourse and quality of sexual life. Healthy carriers and 7 women with previous breast cancer judged the influence of RRM as profoundly negative regarding their body appearance, the discomfort in being naked with their partner, and sexual quality of life, but all of them would choose to undergo RRM again because of the risk reduction.
Bloom et al [24]	2019	Patients undergoing mastectomy reported a decline in breast-specific sensuality. FSFI satisfaction strongly negatively correlated with both anxiety and depression in all participants and reported sexual dysfunction. Among those with cancer, there was a significant decline in the proportion of patients reporting pleasure with caress before compared with after surgery. Furthermore, almost three-quarters of mBRCA who underwent RRM reported a decline in pleasurable caress of their reconstructed breasts, despite retaining their native nipple-areolar complex.
Kazzazi et al [40]	2018	The majority of women reported growing emotionally closer to their partners but becoming more sexually distant. Most reported sexual dysfunction and lack of interest in sex. Several described the impact of contralateral RRM on their intimate lives as devastating and even several years later had not resumed sexual activity; disappointment with their reconstruction took an additional toll on sexual intimacy; those who had undergone reconstruction noted that new breasts were never like part of their body and never became part of their sexual identity.
Unukovych et al [43]	2017	Satisfaction: therapeutic + contralateral RRM < bilateral RRM < bilateral therapeutic mastectomy.
Cornell et al [16]	2017	The therapeutic + contralateral RRM group reported regret about losing nondiseased breast tissue and asymmetry of breasts. In all the groups, sexual well-being scored the lowest; however, the older age of patients was linked to greater sexual well-being in the therapeutic + contralateral RRM group. Sexual well-being was also higher in the bilateral RRM group when more tissue was removed. Complications affected sexual well-being.
Heiniger et al [30]	2015	Bilateral RRM group (healthy women): at 2 y after the procedure, preoperative HRQoL and emotional distress associated with body image and sexual problems. No similar associations in patients with breast cancer who underwent contralateral RRM. Sexual dysfunction declined over time in the following domains: arousal, lubrication, orgasm, satisfaction, and pain. Desire for sex was unchanged. UM group: greatest decline in cumulative FSFI score at follow-up and in the following subscales: arousal, lubrication, orgasm, and satisfaction. UM + CPM group: reduction in all subscales after surgery, but not statistically significant. RRS has minimal long-term impact on body-image and sexual functioning; RRSO women reported more sexual discomfort than control individuals.
Gahn et al [31]	2013	The ability to experience sexual feelings in the breast often was impaired or totally lost.
Gopie et al [32]	2013	Partner relationship satisfaction did not significantly change in time, but the sexual relationship satisfaction tended to decrease up to T2.
Hallowell et al [25]	2012	Many RRM + reconstruction women reported that numbness, pain, and discomfort after surgery negatively affected their sexuality and body image. RRM: sexuality affected by pain due to chest contact, uncomfortable feelings when their partner touches their breast, the numbness of the breast, and the discomfort when their partner sees them naked.

(Continued)

Table 2. Continued

Study	Publication year	Results
Unukovych et al [36]	2012	Sexuality: no statistically significant difference was found preoperatively and postoperatively in the 3 subscales of the SAQ (pleasure, discomfort, sexual habit).
Gahm et al [14]	2010	No relationship between pain in the breast region and a negative impact on sexual enjoyment. Women who regarded their breasts as very important in their sexuality more often reported reduced enjoyment of sex after the BPM. The ability to feel sexual sensations in the breasts was totally lost in 25 (45%) patients and substantially impaired in additionally 22 patients. The breasts were reported to have held great importance in sexuality before the BPM for a majority of patients. The sexual importance of the breasts and sexual enjoyment changed in a negative way after the BPM in 38 (69%) and 41 (75%) patients, respectively. High sexual importance of the breasts before the BPM was related to reduced enjoyment of sex and to a negative change in the breasts' sexual importance after BPM. Nearly half of all women experienced untoward changes in their sexual relationship because of RRM/reconstruction. Changes in sexual relationship significantly associated with perceived lack of information, unmet expectations, ongoing physical complaint and limitations in daily life, altered feelings of femininity and body image, and perception of the partner's negative view of his wife's sexual attractiveness. Pain or hindrance complicated the sexual relationship after surgery. Similar proportions of women with and without RRM reported poor sexual satisfaction. Less contentment with quality of life was also associated with dissatisfaction with sex life, but because 49 women elected to omit this question, we could not adjust for this variable in all models.
Bresser et al [41]	2006	Women with a subcutaneous mastectomy did not have significantly better body images or levels of sexual functioning.
Geiger et al [35]	2006	Women avoided physical intimacy.
Metcalfe et al [33]	2004	Young women who reported lower levels of satisfaction did not seem to do so as a result of poor body image or impaired sexual functioning.
Hatcher et al [26]	2003	Sexual impact: some women in the study did not wish to contemplate the potential impact of the surgery on sexuality, and had not discussed it much with their partner preoperatively. Most were surprised at the lack of physical sensation in their breasts 18 mo postoperatively but saw this as a small price to pay for peace of mind, although there were a few who felt that this badly affected their sexual activity.
Hatcher et al [28]	2001	Women who had surgery (most of whom had had immediate reconstruction) maintained a positive body image and reported few or no changes in sexual activity at each time point.
Hopwood et al [34]	2000	In relation to sexuality, the most frequently reported changes were in sexual attractiveness (55%), feeling less physically attractive (53%), and feeling less feminine (34.7%)

Abbreviations: BPM, Bilateral Prophylactic Mastectomy; CPM, ●●●; HRQL, health-related quality of life; mBRCA, metastatic breast cancer; FSFI, Female Sexual Function Index; RRM, risk-reducing mastectomy; RRS, Risk-reducing Surgery; RRSO, risk-reducing oophorectomy; SAQ, Sexual Activity Questionnaire; UM, unilateral mastectomy.

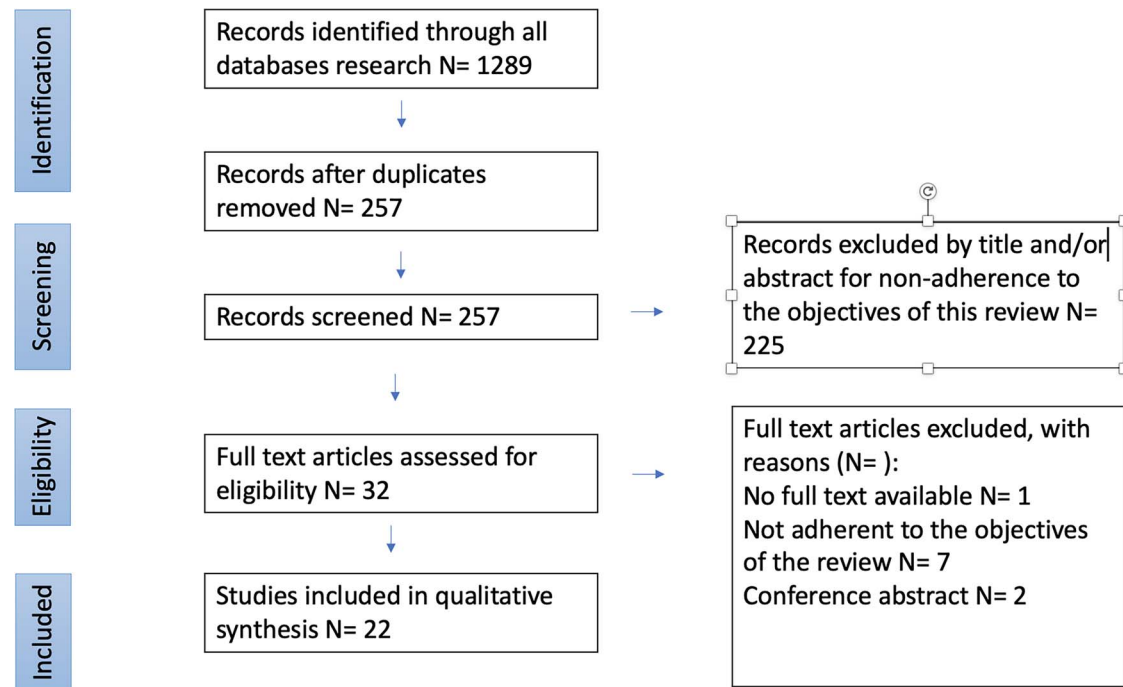


Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram of literature search and selection of publications.

quality index score and 5 scores corresponding to the 5 subscales.

Table 3 shows the results of the methodological assessment of the studies included in the present work.

Considering the articles assessed using the checklist, the dimension that obtained the lowest scores was selection bias (SB), with a mean of 1.6 (range = 0-6), indicating a higher risk of bias within this domain. Reporting bias (RB) and internal validity (IV) received moderate scores, with means of 6.4 (range = 0-11) and 2.7 (range = 0-7), respectively, while the external validity (EV) dimension resulted to be the most solid, with a mean of 3 (range = 0-3).

Consistent with other previous reviews,⁴⁴ the statistical power (P) evaluation has been simplified: 1 point was assigned if the necessary sample size required to detect a significant difference had been calculated and 0 was assigned if it was not or if the sample size was not sufficient to reach adequate statistical power. None of the included studies scored 1 on this dimension.

Discussion

Sexual well-being is a pivotal aspect of quality of life, and RRM has a relevant impact on women's sexual health.⁴⁵

This systematic review aimed at evaluating the levels of sexual health in breast cancer patients who received breast surgery and RRM. Indeed, over the years and with the increment of genetic cancer risk screening, RRM increased in number, and little is still known about the consequences that breast surgery might have on sexual dysfunctions.¹⁶ Plus, little is known about the long-term different impacts of therapies on breast cancer patients and their sexual well-being. For instance, it has been recognized that psychosocial well-being and sexual well-being are significantly worse with mastectomy and reconstruction without radiation therapy.⁵

Other personal factors might shape the impact of treatments. As it has been already recognized, the type of surgical operation, body mass index >30 kg/m², and change in psychological well-being were associated with greater variations in overall sexual well-being in breast cancer patients.⁴⁶

Identifying the possible specific aspects of sexual health that can be hit by breast cancer RRM might increase knowledge of the phenomenon and lead to the creation of tailored interventions.

Overall, except for 2 studies^{26,36} from all the selected studies, a significant negative impact on sexual well-being in breast cancer patients receiving RRM emerged.

Interestingly, both of the studies that did not find a significant lowering of sexual health enrolled patients who received reconstruction immediately after the surgery. The satisfaction with cosmetic aspects postsurgery has indeed been proved to be a protective factor for perceived quality of life.⁴⁷

Furthermore, 2 main interconnected areas of clinical interest can be identified according to the results of the present review and to the psychological sexual aspects changed by the surgery: individual sexual well-being and relational sexual well-being.

Concerning individual sexual well-being, almost all of the studies reported a decrease in general satisfaction with sexuality, which is usually associated with depression and/or anxiety.⁴⁸

The most reported psychological factors were a worsening of body image,^{19,49} together with a decrease in breast sensitivity and bodily sensations^{50,51} sexual attractiveness,^{49,52} and less sexual desire.^{53,54}

Overall, this evidence points out that breast cancer patients experience a worsening of the inner perception of their body and their beliefs about their attractiveness. Indeed, women with a history of breast cancer often report conflicting emotions and thoughts about their body, thus affecting self-esteem and overall psychological status.⁵⁵

Table 3. Assessment results

	2022	2021	2019	2019	2019	2019	2018	2017	2017	2015	2013	2012	2012	2010	2006	2006	2004	2003	2001	2000		
	Mitchalowska,	García-Solbas,	Dikmans,	Modaffari,	Rojas,	Bloom,	Kazzazi,	Unukovysh,	Cornell,	Heiniger,	Gahm,	Gopie,	Hallowell,	Unukovysh,	Gahm,	Bresser,	Geiger,	Metcalfe,	Bebbington,	Hatcher,	Hopwood,	
RB (0-11)	7	7	2	7	7	5	7	7	7	7	6	7	6	7	6	7	7	5	7	7	5	
EV (0-3)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
IV (0-7)	3	3	2	1	3	1	3	4	3	3	3	4	2	3	2	3	3	2	3	3	3	3
SB (0-6)	1	2	0	2	1	1	2	3	3	3	1	2	2	3	0	0	4	0	0	2	0	0
P (0-1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT (0-28)	14	15	7	13	14	10	15	17	16	16	13	17	13	17	11	17	13	10	15	15	11	11

Abbreviations: EV, external validity; IV, internal validity; P, power; RB, reporting bias; SB, selection bias.

Sexual attraction is an important and relevant point of romantic relationships⁵⁶; however, it has been shown that it changes over time within the same couple. Furthermore, it has been demonstrated that sexual satisfaction might follow different trajectories across time, and even if in some couples it decreases, there still can be satisfaction with the relationship.⁵⁷ Indeed, scientific literature shows that the quality of relationships is influenced by several interrelated aspects of couple functioning, such as maladaptive coping strategies, communication, and decision-making styles.^{58,59}

Interestingly, the relationship with the body was reported as an issue by the majority of the studies, and it can be considered both a personal struggle with individual body image and a relational issue with couple intimacy and the experience of being naked and vulnerable in front of partners.

Indeed, concerning the interpersonal side, many studies reported that women who received RRM described relationship issues related to bodily changes and lower matching with partners.^{24,25,27,29,32,39,41}

One of the most stressed points was the discomfort in being naked in front of the partners^{25,39} or the perception that the partner might not accept their body after surgery.²⁵

Even if the intimacy levels with the partners might have increased over time, the intimate and sexual life was reported as reduced after the surgery.²⁴ On a more psychocognitive side, the lack of communication with the partners, information on surgery side effects, and expectations^{26,41} were found to be associated with more negative changes in sexual functions and satisfaction. Thus, from the present results emerged the importance of psychoeducational counseling and of doctor–patient communications. Indeed, informational material regarding side effects, such as impaired breast sensations, changes in perceived breast temperature, different tactile feelings, and risk relapse related to the protheses implantation as procedure, should be developed and used in clinical practice. Good communication and psychoeducational concepts might indeed empower patients and lead to better doctor–patient communication and satisfaction with the medical procedures.⁶⁰

Indeed, the possibility to express inner emotions seems to be a personality characteristic—along with self-efficacy—that can positively influence the quality of life, illness perception after cancer, and the adaptation to cancer-related treatments.⁶¹⁻⁶³ Also, it might be improved with psychological and digital interventions that help to enhance emotional acceptance.^{64,65}

Overall, the results of the present systematic review seem to indicate a general decrease in sexual well-being and satisfaction after surgery and significant findings in sexual dysfunction.

The perception of self and one's body may be compromised due to the physical changes that occur following cancer treatment sequelae. Among the cancer treatments, RRM is one most impactful interventions on a woman's body, sexual well-being, and quality of life.^{66,67}

For example, the removal of one or both breasts may lead to a perception of self as incomplete, resulting in problems with self-image and self-esteem.^{55,68} This can negatively affect sexual well-being and satisfaction, as self-perception is an important factor in the quality of sexual relationships.^{48,69}

In addition, loss of sensitivity or sexual pleasure following surgery can affect sexual satisfaction,⁶⁶ affecting the quality of both individual and relational sexual experience.

Moreover, there is an emerging need to foster better information about sexual outcomes after surgery as described by the studies of Dikmans et al²⁷ and Bresser et al,⁴¹ who highlighted the importance of promoting physician–patient communication. This involves using effective modalities that allow the patient to regain centrality in decision making. In particular, psychodecisional interviewing might prove appropriate, which through the use of the decision tree allows patients to note what factors are involved in their choice, even about undergoing reconstruction interventions and what importance they have in decision making.

In this regard, there is an increasing percentage of women considering to choose mastectomy alone, a movement also known as “going flat.” Results of surveys of women who choose mastectomy alone suggest that it can still be a satisfactory choice in terms of body appearance.^{70,71}

Limitations and future directions

The results of the present systematic review should be interpreted in light of some limitations. First of all, it is unclear if the included studies had sufficient statistical power to detect the effect of interest. Second, from a methodological point of view, the included studies presented a heterogeneous period of follow-up to assess the effect of RRM. Future studies might benefit from the use of standardized time points to evaluate the trajectory and the changes in the impact of RRM on sexual well-being. Plus, the included studies had heterogeneous study designs and control groups. Third, we did not assess or explicitly include studies evaluating possible psychosocial factors affecting sexuality in the sample of interest. This might be an important point for future studies because it has been shown that psychosocial factors can significantly influence sexual health and well-being.^{47,60}

Future studies might also explicitly address if and to what extent there are differences between types of approaches in surgery and among healthy women and women with breast cancer receiving surgery.

Another limit of the included studies in this review is the lack of distinguished analyses about sexual issues between different types of reconstruction, such as implant reconstruction, autologous tissue reconstruction, expander reconstruction, or immediate prosthesis implantation. Indeed, women undergoing various kinds of surgical reconstruction may report different levels of satisfaction with breasts and sexual well-being.

Conclusion

Breast cancer patients who received RRM struggle with several issues, some specifically related to sexual health and well-being, which can be a significant yet underreported symptom.

Results from the present systematic review highlighted the importance and the mutual influence of personal and individual symptoms and relational matching over sexuality in these patients. Body image, attractiveness, and communication might play a pivotal role in treating sexual dysfunctions.

Currently, effective interventions for quality of life and psychosocial well-being in breast cancer patients receiving RRM are needed,⁷² as little is known about the efficacy of possible interventions. The present systematic review might be a first step in the direction of understanding which specific psychological features and issues characterize the individual

and relational experience of breast cancer patients receiving RRM.

Author Contributions

The authors confirm contribution to the article as follows: study conception and design: L.S., K.M., G.P.; data collection: L.S., S.F.M.P.; analysis and interpretation of results: L.S., S.F.M.P., C.M., K.M.; draft manuscript preparation: L.S., S.F.M.P., C.M. All authors reviewed the results and approved the final version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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