Psicooncología
e-ISSN: 1988-8287

ARTÍCULOS

Anxiety and Depressive Symptomatology and Body Image After Risk-Reducing Mastectomy in Women with Increased Risk of Breast Cancer: A Longitudinal Study

Sofía Luque Suárez[1]* , María Eugenia Olivares Crespo[2] , Juana María Brenes Sánchez[3] , María Herrera de la Muela[4]

https://dx.doi.org/10.5209/psic.108426 Recibido: 9 de septiembre de 2025 / Aceptado: 2 de enero de 2026

Abstract: Introduction: Risk-reducing mastectomy (RRM) is an effective preventive strategy for women at high risk of developing breast cancer, particularly those with BRCA1/2 mutations or a strong family history. However, the psychological consequences of this procedure, including anxiety, depressive symptomatology, and body image concerns, remain insufficiently explored in the long term. Objective: To analyze the levels and differences in anxiety, depressive symptomatology, and body image in women at increased risk of breast cancer assessed before surgery, shortly after surgery, and at long-term follow-up following risk-reducing mastectomy. Method: Fifty-five women at increased risk of breast cancer due to BRCA1/2 mutations or significant family history participated in this longitudinal study. Some participants had a previous breast cancer diagnosis. Anxiety and depressive symptomatology were assessed using the Hospital Anxiety and Depression Scale (HADS), and body image was measured with the Body Image Scale (BIS). Assessments were conducted 15–30 days before surgery, 15–30 days after surgery, and at long-term follow-up (mean = 5.24 years post-surgery). Results: A significant main effect of time was observed for anxiety and depressive symptomatology, with higher levels reported at long-term follow-up. Body image scores also worsened significantly over time, particularly at follow-up. No significant time × group interaction effects were found, suggesting similar trajectories across groups. Conclusions: These findings suggest a potential worsening in anxiety, depressive symptomatology, and body image over time following risk-reducing mastectomy, highlighting the importance of long-term psychological monitoring.
Keywords: Anxiety, body image, BRCA1/2, depression, risk-reducing mastectomy, breast cancer.

* Dirección de correspondencia: Sofía Luque Suárez. Facultad de Psicología. Universidad Complutense de Madrid. Campus de Somosaguas. Ctra. de Húmera s/n, 28223 Pozuelo de Alarcón, Madrid, España. E-mail: soluque@ucm.es

[1] Sofía Luque Suárez. Facultad de Psicología. Departamento de Personalidad, Evaluación y Psicología Clínica. Universidad Complutense de Madrid. Madrid, España. ORCID: 0000-0002-7835-893X E-mail: soluque@ucm.es

[2] María Eugenia Olivares Crespo. Facultad de Psicología. Universidad Complutense de Madrid. Madrid, España; Unidad de Patología Mamaria. Instituto de Salud de la Mujer José Botella Llusiá. Hospital Clínico San Carlos. Madrid, España. ORCID: 0000-0002-3559-4094 E-mail: meolivares@cop.es

[3] Juana María Brenes Sánchez. Unidad de Patología Mamaria. Instituto de Salud de la Mujer José Botella Llusiá. Hospital Clínico San Carlos. Madrid, España. ORCID: 0000-0002-7698-9893 E-mail: jbrenes@ucm.es

[4] María Herrera de la Muela. Unidad de Patología Mamaria. Instituto de Salud de la Mujer José Botella Llusiá. Hospital Clínico San Carlos. Madrid, España. ORCID: 0000-0003-1603-5358 E-mail: maria.herrera@salud.madrid.org

ESP Sintomatología ansiosa, depresiva e imagen corporal tras mastectomía reductora de riesgo en mujeres con riesgo aumentado de cáncer de mama: estudio longitudinal

ESP Resumen: Introducción: La mastectomía reductora de riesgo (MRR) constituye una estrategia preventiva eficaz para mujeres con riesgo aumentado de desarrollar cáncer de mama, especialmente aquellas portadoras de mutaciones BRCA1/2 o con antecedentes familiares significativos. Sin embargo, las consecuencias psicológicas de este procedimiento, como la sintomatología ansiosa y depresiva o las alteraciones en la imagen corporal, han sido poco exploradas a largo plazo. Objetivo: Analizar los niveles y las diferencias en sintomatología ansiosa, sintomatología depresiva e imagen corporal en mujeres con riesgo aumentado de cáncer de mama evaluadas antes de la mastectomía reductora de riesgo, inmediatamente después de la misma y en un seguimiento a largo plazo. Método: Participaron 55 mujeres con riesgo aumentado de cáncer de mama debido a mutaciones BRCA1/2 o por agregación familiar; algunas de ellas tenían diagnóstico previo de cáncer de mama. La sintomatología ansiosa y depresiva se evaluó mediante la Escala de Ansiedad y Depresión Hospitalaria (HADS), y la imagen corporal mediante la Body Image Scale (BIS). Las evaluaciones se realizaron entre 15 y 30 días antes de la cirugía, entre 15 y 30 días después y en un seguimiento a largo plazo (media = 5,24 años tras la cirugía). Resultados: La sintomatología ansiosa mostró un efecto principal significativo del tiempo, con niveles más elevados en el seguimiento a largo plazo. La sintomatología depresiva también aumentó significativamente a lo largo del tiempo. Asimismo, la imagen corporal empeoró significativamente, especialmente en el seguimiento. No se encontraron efectos de interacción tiempo × grupo, lo que sugiere trayectorias similares entre los grupos. Conclusiones: Estos resultados sugieren un posible empeoramiento de la sintomatología ansiosa, la sintomatología depresiva y la imagen corporal a lo largo del tiempo tras una mastectomía reductora de riesgo, lo que resalta la importancia del seguimiento psicológico a largo plazo.

Palabras clave: Ansiedad, imagen corporal, BRCA1/2, depresión, mastectomía reductora de riesgo, cáncer de mama

Sumario: 1. Introduction 2. Methods and materials 3. Results 4. Discussion 5. Conclusion 6. Clinical implications 7. References

Cómo citar: Luque Suárez S, Olivares Crespo ME, Brenes Sánchez JM, Herrera de la Muela M. Anxiety and Depressive Symptomatology and Body Image After Risk-Reducing Mastectomy in Women with Increased Risk of Breast Cancer: A Longitudinal Study. Psicooncología 2026; 23; 35-47. https://dx.doi.org/10.5209/psic.108426

1. Introduction

Deleterious mutations in BRCA1 and BRCA2 are the most common causes of hereditary breast and ovarian cancer syndrome[1]. The cumulative lifetime risk of breast cancer for carriers of these mutations increases with age, reaching approximately 70% by the age of 80[2]. Women with a history of breast cancer face a significant risk of developing contralateral breast cancer, estimated at 40–44% for BRCA1 mutation carriers and 26–33.5% for BRCA2 mutation carriers over a 20 to 25-year period[3].

Risk-reducing mastectomy (RRM) provides the greatest reduction in breast cancer risk among BRCA mutation carriers, achieving at least a 90% reduction in risk[4]. For women at high risk without a previous cancer diagnosis, bilateral risk-reducing mastectomy may be considered a primary preventive strategy[5]. Additionally, contralateral risk-reducing mastectomy can reduce the risk of contralateral breast cancer and overall mortality in women previously diagnosed with breast cancer[6].

Although RRM does not completely eliminate the risk of breast cancer, several studies have reported psychological benefits, including reductions in anxiety levels after surgery[7]. McCarthy et al.[8] observed a significant decrease in general anxiety one and two years after bilateral risk-reducing mastectomy. Similarly, Eltahir et al.[9] reported anxiety symptomatology in 11.5% of women who had undergone either bilateral or contralateral risk-reducing mastectomy.

The psychological impact of RRM on depressive symptomatology has produced mixed findings. Bai et al.[10] reported a significant increase in depressive symptoms during long-term follow-up after bilateral risk-reducing mastectomy. In contrast, Unukovych et al.[11] found no differences in depressive symptomatology two years after contralateral risk-reducing mastectomy.

Risk-reducing mastectomy involves the removal of the breasts, which may affect physical integrity and lead to concerns related to body image. Furthermore, multiple surgeries, chronic pain and unsatisfactory cosmetic outcomes may negatively influence psychological well-being[7,12,13].

Body image concerns are frequently reported among women undergoing risk-reducing mastectomy, regardless of previous cancer diagnosis or BRCA mutation status[14]. A systematic review reported dissatisfaction with body image among women with a previous breast cancer diagnosis following contralateral risk-reducing mastectomy[5]. Similarly, Brandberg et al.[15] found that some women experience body image concerns after bilateral risk-reducing mastectomy, and a minority even regret their decision due to dissatisfaction with surgical outcomes. Other studies have also reported dissatisfaction with the results of risk-reducing surgery, leading a small proportion of women to regret their decision[5,7,16].

Despite these findings, the long-term psychological effects of risk-reducing mastectomy on anxiety, depressive symptomatology and body image remain insufficiently explored. Therefore, the aim of the present study was to analyze the levels and differences in these variables among women at increased risk of breast cancer assessed immediately before and after surgery, as well as during long-term follow-up following risk-reducing mastectomy.

2. Method

Participants

A total of 184 women completed the pre-surgical assessment. However, only 97 of these women consented to participate in the follow-up phase of the study. The reasons for participants dropout are outlined in Figure 1. Of the 97 participants, 42 did not complete the post-surgical assessment and were subsequently excluded from the analysis. As a result, the final sample consisted of 55 women.

Procedure

Between January 2011 and January 2023, all women identified as being at high risk for breast cancer or carrying BRCA mutations were referred by the breast pathology unit for psychological evaluations conducted prior to and following RRM. Additionally, a long-term measure was conducted. The study included three evaluation time points: immediately prior to RRM (15–30 days before surgery), immediately post-RRM (15–30 days after surgery), and a long-term follow-up conducted 1 to 15 years post-RRM. The mean time elapsed between the post-surgical evaluation and the long-term follow-up was 5.24 years.

The measures taken immediately before and after the RRM were collected by a different researcher as part of a prior study. As a result, it was not possible to obtain information about the reasons for non-participation in the second measure (immediately after RRM), as this data was not gathered during the earlier project.

This study has the approval of the Ethics and Clinical Research Committee of the Hospital Clínico San Carlos in Madrid to share the following findings.

Design

This study employed a longitudinal design with repeated measures.

Variables and Instruments

Anxiety and depressive symptomatology. Hospital Anxiety and Depression Scale (HADS)[17] validated for the Spanish population[18] was used to assess anxiety and depressive symptomatology. The HADS is a 14-item self-report questionnaire designed to measure these variables, where higher scores indicate greater symptomatology severity. Clinical cut-off scores are as follows: 0–7 (normal), 8–10 (mild), 11–14 (intermediate), and 15–21 (severe)[17]. The Cronbach's alpha coefficient was 0.83 for the anxiety subscale and 0.86 for the depressive symptomatology subscale.

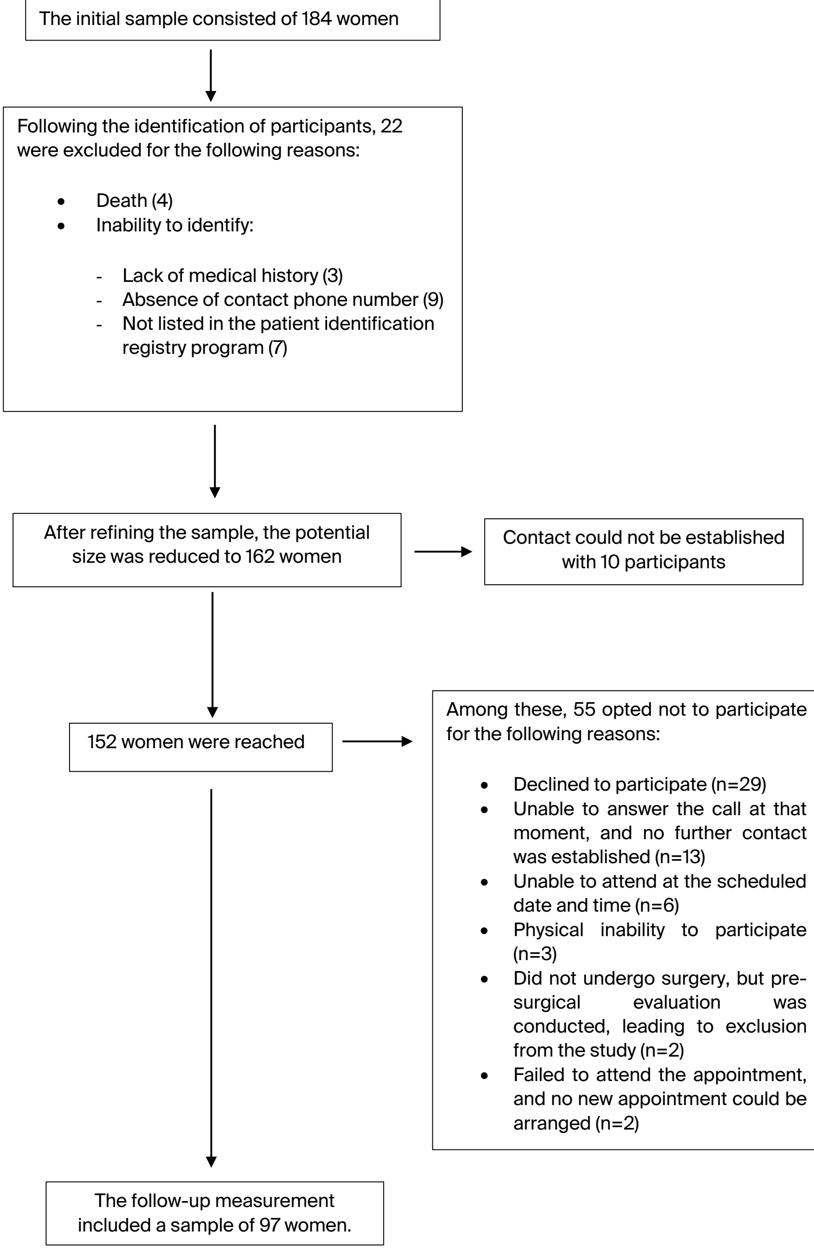

Figure 1. Flowchart of sample recruitment for long-term follow-up in the study

Body image. Body Image Scale (BIS)[19] in its Spanish version[20] is a 10-item instrument designed for cancer patients to evaluate the impact of surgery on body image. It measures aspects such as self-consciousness, physical/sexual attractiveness, femininity, satisfaction with body and scars, body integrity, and avoidance behavior post-surgery. Higher scores reflect worse body image. The scale demonstrated high internal consistency, with a Cronbach's alpha of 0.91.

Statistical analysis

Data analyses were conducted using the Statistical Package for Social Sciences (SPSS), version 22.0. Descriptive analyses were performed to explore participants' sociodemographic and health characteristics. The Chi-square test was applied to analyze associations between the independent variables. To assess the effect size of group differences, Cohen's d was calculated, with effect sizes categorized as small (d = 0.2), medium (d = 0.5), and large (d = 0.8), according to Cohen's benchmarks[21].

To examine differences in the dependent variables (anxiety, depressive symptomatology, and body image) across groups defined by independent variables (presence/absence of a previous breast cancer diagnosis and presence/absence of BRCA1/2 mutation), a General Linear Model (GLM) was employed. These differences are reported as *main effects* in the results section. Additionally, the GLM was used to assess whether the groups exhibited different trajectories over time, across pre-RRM, post-RRM, and long-term follow-up assessments. This analysis is described as the *time x group interaction* in the results section. The model also allowed for the observation of intragroup differences in the independent variables at various time points.

3. Results

Sociodemographic and health characteristics

The sample consisted of 55 women, with an average age of 51.5 years. Regarding education level, 43.6% (n=24) had higher education, making it the most common category. In terms of marital status, 63.6% (n=35) were married or living with a stable partner.

For the independent variables, 56.4% (n=31) were BRCA1/2 mutation carriers, and 74.5% (n=41) had a personal history of cancer. Notably, 7.3% (n=4) were non-carriers without a breast cancer history, while 36.4% (n=20) were non-carriers with a previous breast cancer diagnosis. Additionally, 18.2% (n=10) were BRCA1/2 mutation carriers without a cancer history, and 38.1% (n=21) were carriers with a previous cancer diagnosis. There was no significant association between BRCA1/2 mutation status and the presence/absence of cancer (χ^2 = 1.77, p = 0.22) (see table 1). Furthermore, 61.8% of the participants underwent risk-reducing procedures following genetic counseling.

Table 1. Crosstab BRCA1/2 mutation (absence/presence) and breast cancer diagnosis (absence/presence)

		BRCA1/2 MUTATION			
		Presence	**Abscence**	χ^2	*p*
BREAST CANCER DIAGNOSIS	**Absence**	4 (7.30%)	10 (18.2%)	1.77	0.22
	Presence	20 (36.4%)	21 (38.1%)		

Note. (N=55)

Regarding breast cancer treatments, 73.1% of those diagnosed had undergone therapeutic surgery, 51.2% had received hormone therapy, 61.0% had undergone radiotherapy, and 68.3% had received chemotherapy.

For risk-reducing surgeries, 52.7% (n=29) had a bilateral risk-reducing mastectomy, while 47.2% (n=26) underwent a contralateral mastectomy. All participants received reconstructive surgery, with prosthetic reconstruction being the most common method (90.9%; n=50). Of the participants, 76.4% (n=42) considered their breast reconstruction process complete, with an average time of 2.11 years to finalize, including areola-nipple complex micropigmentation.

Additionally, 29.1% (n=16) required reoperation, with 42.9% undergoing at least one further surgery. Complications from reconstruction were reported by 29.1% (n=16), with prosthesis encapsulation being the most frequent issue (62.5%; n=10).

Psychological Differences related to RRM based on Previous Breast Cancer Diagnosis (Presence or Absence of Breast Cancer Diagnosis)

No significant time × group interaction effects were found for any of the dependent variables. (Table 2).

Table 2. Main effects of breast cancer diagnosis (presence/absence)

Variables	time			Time x group		
	F	**ηp²**	**β₁**	**F**	**ηp²**	**β₁**
Anxiety symptomatology (HADS)	**25.38*** **	0.54	1	0.94	0.04	0.20
Depressive symptomatology (HADS)	**9.60*** **	0.32	0.97	0.70	0.03	0.15
Body image (BIS)	**50.19*** **	0.68	1	1.34	0.55	0.27

Note. (N=55) ; ηp²—partial eta-squared; bold values—statistical significance. * (p<0.05). **(p<0.01).***(p<0.001).

Anxiety and depressive symptomatology

A significant main effect of time was observed for anxiety symptomatology ($F_{(1,53)}$=25.38, p<0.01, ηp^2=0.33) (Table 2). Anxiety levels increased from pre-surgery to long-term follow-up. Although scores rose across time points, only the comparison between pre-RRM and follow-up reached statistical significance (p<0.01), with a large effect size (Table 3). Similar patterns were observed across groups, with no significant time × group interaction effects.

A significant main effect of time was also found for depressive symptomatology ($F_{(1,53)}$=9.60, p<0.01, ηp^2=0.32) (Table 2). Depressive symptomatology increased over time, although only some comparisons reached statistical significance (Table 3). No significant interaction effects were observed, indicating similar trajectories across groups.

Body image

A significant main effect of time was observed for body image ($F_{(1,53)}$= 50.19, p < 0.01, η_p^2 = 0.68) (Table 2). Body image scores worsened over time. Although scores decreased across assessment points, only two comparisons reached statistical significance: from post-RRM to follow-up (p < 0.01) and from pre-RRM to follow-up (p < 0.01), both with large effect sizes (Table 3). No significant time × group interaction effects were found, indicating similar trajectories across groups.

Table 3. Psychological Differences related to RRM based on Previous Breast Cancer Diagnosis (Presence or Absence of Breast Cancer Diagnosis)

Women without cancer diagnosis (N= 14)			**Women with cancer diagnosis (N= 41)**		
	Means (SD)	**Cohen's d**		**Mean (SD)**	**Cohen's D**
Anxiety symptomatology (HADS)			Anxiety symptomatology (HADS)		
Pre-RRM- Post-RRM	10.84 (3.13) - 14.62 (3.75)	-	**Pre-RRM- Post-RRM***	11.96 (2.93) - 14.50 (3.21)	0.58
Post-RRM-follow-up	14.62 (3.75) - 16.15 (2.03)	-	Post-RRM-follow-up	14.50 (3.21) - 15.56 (2.13)	-
Pre-RRM-follow-up***	10.84 (3.13) - 16.15 (2.03)	1.42	**Pre-RRM-follow-up*****	11.96 (2.93) -15.56 (2.13)	0.99
Depressive symptomatology (HADS)			Depressive symptomatology (HADS)		
Pre-RRM- Post-RRM*	8.50 (2.27) - 11.75 (2.26)	1.04	Pre-RRM- Post-RRM	10.06 (3.02) - 11.58 (3.18)	-
Post-RRM-follow-up	11.75 (2.26) - 12.08 (2.99)	-	Post-RRM-follow-up	11.58 (3.18) - 12.90 (3.16)	-
Pre-RRM-follow-up*	8.50 (2.27) - 12.08 (2.99)	0.95	**Pre-RRM-follow-up****	10.06 (3.02) -12.90 (3.16)	0.65
Body image (BIS)			**Body image (BIS)**		
Pre-RRM- Post-RRM	1.85 (3.67) - 5.21 (4.42)	-	Pre-RRM- Post-RRM	4.54 (5.77) - 6.77 (4.96)	-
Post-RRM-follow-up***	5.21 (4.42) - 16.28 (9.43)	1.06	**Post-RRM-follow-up*****	6.77 (4.96) - 14.85 (5.29)	1.11
Pre-RRM-follow-up***	1.85 (3.67) - 16.28 (9.43)	1.42	**Pre-RRM-follow-up*****	4.54 (5.77) - 14.85 (5.29)	1.31

Note. N=55. SD —standard deviation; bold values—statistical significance. * (p<0.05). **(p<0.01).***(p<0.001).

Psychological Differences related to RRM based on BRCA1/2 mutation status (presence/absence of BRCA1/2 mutation).

No *time* × *group interaction* effect was found in any of the dependent variables examined (Table 4).

Anxiety and depressive symptomatology

A significant main effect of time was observed for anxiety symptomatology ($F_{(1,53)} = 26.16$, $p < 0.01$, $\eta_p^2 = 0.55$) (Table 4), indicating changes across assessment points.

Table 4. Main effects of BRCA1/2 mutation (presence/absence)

Variables	time			Time x group		
	F	**ηp²**	**β_1**	**F**	**ηp²**	**β_1**
Anxiety symptomatology (HADS)	**26.16*** **	0.55	1	3.09	0.12	0.56
Depressive symptomatology (HADS)	**10.11*** **	0.33	0.97	0.03	0.01	0.05
Body image (BIS)	**50.74*** **	0.68	1	0.67	0.02	0.15

Note. (N=55) ; ηp²—partial eta-squared; bold values—statistical significance. * (p<0.05). **(p<0.01).***(p<0.001).

Across assessment points, anxiety levels increased from pre-surgery to follow-up. However, only the comparison between post-RRM and follow-up reached statistical significance ($p < 0.01$), with a small effect size (Table 5). No significant time × group interaction effects were found.

Table 5. Psychological Differences related to RRM based on BRCA1/2 mutation status (presence/absence of BRCA1/2 mutation).

Women without BRCA1/2 mutation (N=24)			**Women with BRCA1/2 mutation (N=31)**		
	Means (SD)	**Cohen's D**		**Mean (SD)**	**Cohen's D**
Anxiety symptomatology (HADS)			**Anxiety symptomatology (HADS)**		
Pre-RRM- Post-RRM	12.50 (3.28) - 14.60 (3.10)	-	**Pre-RRM- Post-RRM*** **	10.96 (2.62) - 14.48 (3.57)	0.79
Post-RRM-follow-up	14.60 (3.10) - 15.10(1.83)	-	Post-RRM-follow-up	14.48 (3.57) - 16.24 (2.20)	-
Pre-RRM-follow-up*	12.50 (3.28) - 15.10 (1.83)	0.60	**Pre-RRM-follow-up*** **	10.96 (2.62) - 16.24 (2.20)	1.54
Depressive symptomatology (HADS)			Depressive symptomatology (HADS)		
Pre-RRM- Post-RRM	9.84 (2.96) - 11.68 (2.75)	-	Pre-RRM- Post-RRM	9.45 (2.88) - 11.58 (3.10)	-
Post-RRM-follow-up	11.68 (2.75) - 12.73 (2.86)	-	Post-RRM-follow-up	11.58 (3.10) - 12.62 (3.34)	-
Pre-RRM-follow-up*	9.84 (2.96) - 12.73 (2.86)	0.78	**Pre-RRM-follow-up** **	9.45 (2.88) - 12.62 (3.34)	0.71
Body image (BIS)			Body image (BIS)		
Pre-RRM- Post-RRM	3.81 (6.46) - 7.63 (4.81)	-	Pre-RRM- Post-RRM	3.74 (4.38) - 5.25 (4.64)	-
Post-RRM-follow-up* **	7.63 (4,81) - 16.40 (8.14)	0.92	**Post-RRM-follow-up*** **	5.25 (4.64) - 14.33 (5.12)	1.31
Pre-RRM-follow-up* **	3.81 (6.46) - 16.40 (8.14)	1.21	**Pre-RRM-follow-up*** **	3.74 (4.38)- 14.33 (5.12)	1.51

Note. N=55. SD —standard deviation; bold values—statistical significance. * (p<0.05). **(p<0.01).***(p<0.001).

Anxiety levels tended to increase across assessment points, from mild levels before RRM to severe levels at follow-up. However, only two comparisons reached statistical significance: between pre- and post-RRM ($p < 0.01$), with a medium effect size, and between pre-RRM and follow-up ($p < 0.01$), with a large effect size (Table 5). No significant time × group interaction effects were found.

A significant main effect of time was observed for depressive symptomatology ($F_{(1,53)} = 10.31$, $p < 0.01$, $\eta_p^2 = 0.33$) (Table 4). Depressive symptomatology tended to increase over time, although only some comparisons reached statistical significance (Table 5). No significant interaction effects were found, indicating similar trajectories across groups.

Body image

A significant main effect of time was observed for body image ($F_{(1,53)} = 50.74$, $p < 0.01$, $\eta_p^2 = 0.24$) (Table 4). Body image scores decreased over time. However, only two comparisons reached statistical significance: between post-RRM and follow-up ($p < 0.01$) and between pre-RRM and follow-up ($p < 0.01$), both with large effect sizes (Table 5). No significant time × group interaction effects were found, indicating similar trajectories across participants.

4. Discussion

RRM offers significant breast cancer risk reduction for BRCA mutation carriers, achieving a risk reduction of at least 90%[4]. However, RRM involves the removal of the breasts which affects physical integrity and it may have a negative impact on body image due to multiple surgeries, chronic pain and poor cosmetic outcomes[7,12,13].

Regarding the aim of this study revealed no significant association between the presence or absence of BRCA1/2 mutations and the occurrence of a breast cancer diagnosis in the sample. This finding was somewhat unexpected, given that nearly 70% of participants underwent RRM following oncogenetic counseling. The absence of this association might be attributed to the limited sample size of the study.

In terms of anxiety, our study found a significant main effect of time, indicating an overall increase in anxiety symptomatology across assessment points. Significant increases were observed across participants, with no significant differences in trajectories between groups. Additionally, women with a cancer diagnosis and BRCA1/2 mutation exhibited significant increases in anxiety from pre- to post-surgical assessments. This contrasts with prior studies, such as Bai et al.[10] and Heiniger et al.[22] which reported no significant long-term changes in anxiety after RRM (11 years and 3 years, respectively). A systematic review suggested that, in terms of anxiety symptomatology, there were no significant differences between women who underwent RRM and those who did not, nor across different follow-up time frames[23]. However, McCarthy et al.[8] observed a decrease in general anxiety five years after RRM.

One possible explanation for the increase in anxiety symptomatology at the time of follow-up could be the extended duration of the reconstruction process. While the typical timeframe for completing a mastectomy with reconstruction, including micropigmentation, is around one and a half years[24], our participants averaged 2.11 years to complete the process, with 29.1% requiring reoperations and 42.9% undergoing multiple surgeries. Complications, such as prosthesis encapsulation, were common. These factors—prolonged recovery, repeated surgeries, and complications—may have contributed to heightened uncertainty, emotional distress, and ultimately, increased anxiety levels at the time of follow-up.

Similarly, depressive symptomatology progressively increased across assessments. Significant rises in depression were found between pre-surgical and follow-up assessments for all groups, and between pre- and post-surgical evaluations for women without a cancer diagnosis. These findings align with Bai et al.[10] who observed that both women with and without an oncological diagnosis exhibited higher scores in long-term assessments compared to the evaluation conducted one year after the intervention. A study found that women with higher scores on the HADS depression scale suggested that pre-existing psychological distress is not necessarily alleviated

by surgery alone[25]. However, some studies found no change in depressive symptomatology at the time of the follow-up[22,26–28].

In terms of body image, all participants—regardless of cancer diagnosis or BRCA status—experienced a significant decline in body image between post-surgical and follow-up assessments, as well as between pre-surgical and follow-up assessments. This decline is consistent with findings from previous research, a systematic review concluded that the perception of self and body image may be compromised due to the physical changes resulting from cancer treatment sequelae [29]. Among the cancer treatments, RRM is one most impactful interventions on a woman's body, sexual well-being, and quality of life[29]. In this regard, Bai et al.[10] reported that a large proportion of women without breast cancer and with breast cancer diagnosis experienced issues related to sexual and physical attractiveness during long-term follow-up. Additionally, a significant proportion of women in both groups expressed dissatisfaction with their scars at long-term assessment. Other body image issues, such as feeling less feminine after surgery, difficulties in seeing oneself naked, or feeling less whole, also persisted over time[10].

Regarding reconstruction type, higher satisfaction with breast appearance was reported following autologous reconstruction compared to implant-based reconstruction[30]. Most patients in this study underwent prosthesis-based reconstruction, which is more commonly associated with higher body image dissatisfaction compared to autologous tissue reconstruction[31]. Furthermore, complications related to reconstruction occurred in 29.1% of the sample, with prosthesis encapsulation being the most frequent issue. In this regard, the scientific literature often shows that cosmetic dissatisfaction is associated with the presence of surgical complications, reconstruction-related complications, or both[5].

To better understand the long-term results of this study, an analysis was conducted to determine whether there were differences over time between women who had completed the breast reconstruction process and those who had not, in relation to anxiety symptomatology, depressive symptomology, and body image. No statisically significant differences were found in the interaction between the variable " breast reconstruction process completed" (yes/no) and the variables of anxiety and depressive symptomatology. However, no significant interaction was observed for body image ($F_{(1,53)} = 3.03$, $p = 0.05$, $\eta_p^2 = 0.06$). Carbine et al.[5] concluded that, while women generally express satisfaction with the decision to undergo RRM, they are less satisfied with the cosmetic outcomes. Although more complex analyses are needed, the data suggest that increased anxiety and depressive symptomatology, as well as a decline in body image, may be associated with the breast reconstruction process, although no significant interaction effects were found.

This study has several limitations that should be considered when interpreting the results. First, the sample size was relatively small, which limits the ability to generalize the findings to the broader population.

A significant selection bias was observed due to sample attrition between the first and second measurements. This issue represents a methodological concern, as no information was collected regarding the reasons for non-participation in subsequent stages of the study.

5. Conclusion

All participants regardless of prior breast cancer diagnosis or BRCA1/2 mutation status showed an increased anxiety and depressive symptomatology, as well as a deterioration in body image long term after a risk-reducing surgery. Women without a previous breast cancer diagnosis and those with a BRCA1/2 mutation exhibited a similar trajectory of anxiety, beginning with mild anxiety before surgery, progressing to intermediate levels immediately after RRM, and culminating in severe anxiety at follow-up. In contrast, women with a prior breast cancer diagnosis and those without a BRCA1/2 mutation experienced intermediate anxiety levels both before and after RRM, which escalated to severe anxiety by the follow-up assessment. Moreover, all participants reported mild depressive symptomatology prior to surgery, which increased to intermediate levels immediately after RRM and persisted at that level during follow-up. Regarding body image,

participants showed normal levels before and after RRM, but their body image declined to clinical levels by follow-up.

These changes may be influenced by the challenges associated with the breast reconstruction process. Importantly, addressing pre-existing anxiety and depressive symptomatology prior to surgery is crucial to help prevent its exacerbation.

Clinical Implications

Risk-reducing mastectomy is a preventive approach for women at elevated risk of developing breast cancer. This procedure entails the removal of breast tissue, which can impact physical integrity and potentially lead to negative effects on body image and may also have a significant psychological impact on the women who undergo such procedures.

This study offers a long-term perspective on the psychological impact of risk-reducing mastectomy, highlighting its effects on anxiety, depressive symptomatology, and body image. The findings suggest that addressing pre-existing anxiety and depressive symptomatology before surgery is crucial to mitigating potential exacerbation postoperatively. These psychological changes may be influenced by the challenges associated with the breast reconstruction process.

This study highlights the need to incorporate routine psychological evaluation before risk-reducing mastectomy —especially throughout the reconstruction process. Clinicians should be aware that unresolved anxiety, depression, and complications during reconstruction may negatively impact long-term outcomes. Implementing targeted psychological support could improve recovery, patient satisfaction, and adherence to follow-up care.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Due to ethical and privacy considerations, data cannot be shared publicly to protect participant confidentiality.

Ethics approval statement

This study has the approval of the Ethics and Clinical Research Committee of the Hospital Clínico San Carlos in Madrid.

This study has the approval of the Ethics and Clinical Research Committee of the Hospital Clínico San Carlos in Madrid to share the findings.

6. References

1. Evans O, Gaba F, Manchanda R. Population-based genetic testing for women's cancer prevention. Best Pract Res Clin Obstet Gynaecol 2020;65:139-53. https://doi.org/10.1016/j.bpobgyn.2020.02.007
2. Kuchenbaecker KB, Hopper JL, Barnes DR, Phillips KA, Mooij TM, Roos-Blom MJ, et al. Risks of breast, ovarian, and contralateral breast cancer for BRCA1 and BRCA2 mutation carriers. JAMA 2017;317:2402-16. https://doi.org/10.1001/jama.2017.7112.
3. Rhiem K, Engel C, Graeser M, Zachariae S, Kast K, Kiechle M, et al. The risk of contralateral breast cancer in patients from BRCA1/2 negative high risk families as compared to patients from BRCA1 or BRCA2 positive families: a retrospective cohort study. Breast Cancer Res 2012;14:1-8. https://doi.org/10.1186/bcr3369.
4. Franceschini G, Masetti R. What the surgeons should know about bilateral prophylactic mastectomy in BRCA mutation carriers. Eur J Breast Health 2019;15:135-56. https://doi.org/10.5152/ejbh.2019.4651
5. Carbine NE, Lostumbo L, Wallace J, Ko H. Risk-reducing mastectomy for the prevention of primary breast cancer. Cochrane Database Syst Rev 2018;4. https://doi.org/10.1002/14651858.CD002748.pub4

6. Li X, You R, Wang X, Liu C, Xu Z, Zhou J, et al. Effectiveness of prophylactic surgeries in BRCA1 or BRCA2 mutation carriers: a meta-analysis and systematic review. Clin Cancer Res 2016;22:3971-81. https://doi.org/10.1158/1078-0432.CCR-15-1465.
7. Gahm J, Wickman M, Brandberg Y. Bilateral prophylactic mastectomy in women with inherited risk of breast cancer – prevalence of pain and discomfort, impact on sexuality, quality of life and feelings of regret two years after surgery. Breast 2010;19:462-9. https://doi.org/10.1016/j.breast.2010.05.003
8. McCarthy CM, Hamill JB, Kim HM, Qi J, Wilkins E, Pusic AL. Impact of bilateral prophylactic mastectomy and immediate reconstruction on health-related quality of life in women at high risk for breast carcinoma: results of the mastectomy reconstruction outcomes consortium study. Ann Surg Oncol 2017;24. https://doi.org/10.1245/s10434-017-5915-2.
9. Eltahir Y, Werners LLCH, Dreise MM, van Emmichoven IAZ, Jansen L, Werker PMN, et al. Quality-of-life outcomes between mastectomy alone and breast reconstruction: comparison of patient-reported BREAST-Q and other health-related quality-of-life measures. Plast Reconstr Surg 2013. https://doi.org/10.1097/PRS.0b013e31829586a7
10. Bai L, Arver B, Johansson H, Sandelin K, Wickman M, Brandberg Y. Body image problems in women with and without breast cancer 6–20 years after bilateral risk-reducing surgery – a prospective follow-up study. Breast 2019;44. 10.1016/j.breast.2019.01.013.
11. Unukovych D, Wickman M, Sandelin K, Arver B, Johansson H, Brandberg Y. Associations between reoperations and psychological factors after contralateral risk-reducing mastectomy: a two-year follow-up study. Int J Breast Cancer 2016. https://doi.org/10.1155/2016/4604852.
12. Kautz-Freimuth S, Redaèlli M, Isselhard A, Shukri A, Vodermaier A, Rhiem K, et al. Evaluation of two evidence-based decision aids for female BRCA1/2 mutation carriers in Germany: study protocol for a randomised controlled parallel-group trial. Trials 2022;23:157. 10.1186/s13063-022-06081-7.
13. Metcalfe KA, Price MA, Mansfield C, Hallett DC, Lindeman GJ, Fairchild A, et al. Predictors of long-term cancer-related distress among female BRCA1 and BRCA2 mutation carriers without a cancer diagnosis: an international analysis. Br J Cancer 2020;123. https://doi.org/0.1038/s41416-020-0861-3.
14. Luque S, Olivares ME, Brenes JM, Herrera M. Immediate psychological implications of risk-reducing mastectomies in women with increased risk of breast cancer: A comparative study. Clin Breast Cancer 2024. https://doi.org/10.1016/j.clbc.2024.07.005
15. Brandberg Y, Arver B, Johansson H, Wickman M, Sandelin K, Liljegren A. Less correspondence between expectations before and cosmetic results after risk-reducing mastectomy in women who are mutation carriers: a prospective study. Eur J Surg Oncol 2012;38. https://doi.org/10.1016/j.ejso.2011.10.010
16. Pilgrim S, Pain S. Bilateral risk-reducing mastectomy is the safest strategy in BRCA1 carriers. Eur J Surg Oncol 2014;40:670-2. https://doi.org/10.1016/j.ejso.2014.02.218
17. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361-70. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x
18. Caro Gabalda I, Ibáñez E. Escala hospitalaria de ansiedad y depresión. Su utilidad práctica en psicología de la salud. Boletín Psicol 1992;36:43-69.
19. Hopwood P, Fletcher I, Lee A, Al Ghazal S. A body image scale for use with cancer patients. Eur J Cancer 2001;37:189-97. https://doi.org/10.1016/S0959-8049(00)00353-1
20. Gómez-Campelo P, Bragado-Álvarez C, Hernández-Lloreda MJ, Sánchez-Bernardos ML. The Spanish version of the Body Image Scale (S-BIS): psychometric properties in a sample of breast and gynaecological cancer patients. Support Care Cancer 2015;23:473-81. https://doi.org/10.1007/s00520-014-2383-0
22. Cohen J. Statistical power analysis for the behavioral sciences. New York: Routledge; 2013.
23. Heiniger L, Butow PN, Coll J, Bullen T, Wilson J, Baylock B, et al. Long-term outcomes of risk-reducing surgery in unaffected women at increased familial risk of breast and/or ovarian cancer. Fam Cancer 2015;14:105-15. https://doi.org/10.1007/s10689-014-9759-7

24. Wei X, Oxley S, Sideris M, Kalra A, Brentnall A, Sun L, et al. Quality of life after risk-reducing surgery for breast and ovarian cancer prevention: a systematic review and meta-analysis. Am J Obstet Gynecol 2023;229:388-409. https://doi.org/10.1016/j.ajog.2023.03.045
25. Gopie JP, Mureau MAM, Seynaeve C, Ter Kuile MM, Menke-Pluymers MBE, Timman R, et al. Body image issues after bilateral prophylactic mastectomy with breast reconstruction in healthy women at risk for hereditary breast cancer. Fam Cancer 2013;12:479-87. https://doi.org/10.1007/s10689-012-9588-5
26. Gandhi A, Duxbury P, Murphy J, Foden P, Lalloo F, Clancy T, et al. Patient reported outcome measures in a cohort of patients at high risk of breast cancer treated by bilateral risk reducing mastectomy and breast reconstruction. J Plast Reconstr Aesthet Surg 2022;75:69-76. https://doi.org/10.1016/j.bjps.2021.06.012.
27. Brandberg Y, Sandelin K, Erikson S, Jurell G, Liljegren A, Lindblom A, et al. Psychological reactions, quality of life, and body image after bilateral prophylactic mastectomy in women at high risk for breast cancer: a prospective 1-year follow-up study. J Clin Oncol 2008;26:3943-9. https://doi.org/10.1200/JCO.2007.13.9568.
28. Geiger AM, Nekhlyudov L, Herrinton LJ, Rolnick SJ, Greene SM, West CN, et al. Quality of life after bilateral prophylactic mastectomy. Ann Surg Oncol 2007;14:686-94. https://doi.org/10.1245/s10434-006-9206-6.
29. Isern AE, Tengrup I, Loman N, Olsson H, Ringberg A. Aesthetic outcome, patient satisfaction, and health-related quality of life in women at high risk undergoing prophylactic mastectomy and immediate breast reconstruction. J Plast Reconstr Aesthet Surg 2008;61. https://doi.org/10.1016/j.bjps.2007.08.006
30. Scotto L, Pizzoli SFM, Marzorati C, Mazzocco K, Pravettoni G. The impact of prophylactic mastectomy on sexual well-being: a systematic review. Sex Med Rev 2024;12:164-77. https://doi.org/10.1093/sxmrev/qead054
31. Eltahir Y, Werners LLCH, Dreise MM, van Emmichoven IAZ, Werker PMN, de Bock GH. Which breast is the best? Successful autologous or alloplastic breast reconstruction: patient-reported quality-of-life outcomes. Plast Reconstr Surg 2015;135:43-50. https://doi.org/10.1097/PRS.0000000000000804.
32. Kazzazi F, Haggie R, Forouhi P, Kazzazi N, Wyld L, Malata CM. A comparison of patient satisfaction (using the BREAST-Q questionnaire) with bilateral breast reconstruction following risk-reducing or therapeutic mastectomy. J Plast Reconstr Aesthet Surg 2018;71. https://doi.org/10.1016/j.bjps.2018.06.011