

REVIEW

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Kinesiotherapy and Quality of Life after Breast Cancer Surgery: A Systematic Review with Meta-analysis

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Abstract

Objective: To determine whether kinesiotherapy improves the quality of life of women with breast cancer following surgery. **Methods:** This meta-analysis was conducted according to the Cochrane and PRISMA recommendations. A search was conducted of the PubMed, Cochrane, and the Virtual Health Library Regional Portal databases to identify randomized and observational studies that compared the performance versus non-performance of kinesiotherapy protocols in patients who had undergone breast cancer surgery. The outcomes evaluated were overall health status, physical functioning, emotional functioning, and social functioning. Statistical analyses were conducted using RevMan version 5.4.1. Heterogeneity was evaluated using the I² statistic. **Results:** Twelve studies with a total of 867 patients were included. Of these, 669 women (77.2%) underwent mastectomy. Five studies conducted a before-after evaluation and seven studies evaluated intervention versus non-intervention in two different groups. Of the outcomes evaluated, overall health status (standardized mean difference [SMD] 0.45; 95%CI: 0.09-0.82; p=0.01; I²=75%), physical functioning (SMD 0.89; 95%CI: 0.39-1.39; p=0.0005; I²=91%), social functioning (0.67; 95%CI: 0.26-1.09; p=0.001; I²=89%) and emotional functioning (SMD 0.90; 95%CI: 0.40-1.40; p=0.0004; I²=92%) showed significant results in favor of kinesiotherapy. **Conclusion:** Kinesiotherapy had a positive effect on the outcomes of overall health status and physical, social, and emotional functioning compared to controls. Therefore, kinesiotherapy appears to help recover quality of life in patients submitted to surgery for breast cancer.

Keywords: Breast cancer- kinesiotherapy- mastectomy- quality of life- physiotherapy

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Introduction

Surgery remains the core treatment for most cases of breast cancer; however, it can be preceded by systemic neoadjuvant therapies in women with locally advanced disease or otherwise, according to specific protocols [1]. Breast surgery includes the different techniques of mastectomy and breast-conserving surgery, with the type of surgery being determined according to tumor size, breast volume and other factors [1]. In recent years, a progressive increase has been seen worldwide in the rates of breast-conserving surgery [2, 3], with improvements in aesthetic results being achieved together with oncologic outcomes that are similar to those found with mastectomy [4, 5].

Despite the advent of new techniques and the advances in the surgical treatment of breast cancer, postoperative complication rates range from 10% to 30% in the majority of international series [6, 7]. Most of the acute complications are those inherent to any surgical procedure and can be easily managed on an outpatient

basis; nonetheless, they may culminate in repeat surgery and loss of the reconstructed breast [8, 9]. Conversely, chronic complications such as lymphedema and axillary web syndrome can cause chronic pain, restrict activities of daily living and decrease postoperative quality of life [9].

In view of the negative impact of breast cancer surgery on quality of life, various strategies to reverse this trend have been evaluated over recent years, often with conflicting results [10]. Of the approaches involving physiotherapy, kinesiotherapy is the most inexpensive and easily accessible option [11]. It consists of a set of therapeutic exercises including stretching movements, isometric exercises and muscle-strengthening exercises, preferably performed under supervision. Although this represents an option for improving complications resulting from breast cancer surgery, few studies have evaluated the effect of kinesiotherapy on the quality of life of this population. Consequently, this systematic review and meta-analysis was conducted to evaluate the impact of kinesiotherapy on the quality of life of women submitted to surgery to treat breast cancer.

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Materials and Methods

Data collection

This meta-analysis was conducted in accordance with the Cochrane and PRISMA guidelines and is registered in PROSPERO under reference CRD42023410480. Observational and randomized studies comparing the application versus non-application of a protocol of kinesiotherapy in women submitted to breast cancer surgery were included. In the studies included in the meta-analysis, a quality of life questionnaire was applied to evaluate differences between groups. Two raters (MGR and VAM) performed the data collection. Articles for which both raters were in agreement were included, with a third rater (LRS) being brought in to settle any disagreements.

Search strategy

A systematic search was conducted of the PubMed, Cochrane and the Virtual Health Library Regional Portal (VHL) databases in May 2024, with no restrictions being placed on publication date or language. The following terms were used in the search strategy: (mastectomy OR “breast cancer surgery” OR “breast conserving surgery” OR quadrantectomy OR oncoplastic) AND (kinesiotherapy OR physiotherapy OR physical activity OR exercises OR stretching OR mobilization OR rehabilitation OR “exercise protocol” OR “rehabilitative treatment”).

Risk of bias

The Cochrane Risk of Bias tool for randomized trials (RoB 2) and the Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) were used accordingly [12,13]. The RoB 2 tool consists of five domains that are classified as “high”, “low” or expressing “some concerns”. These are: bias arising from the randomization process; bias due to deviations from intended interventions; bias due to missing outcome data; bias in measurement of the outcome; and bias in selection of the reported result [13]. The ROBINS-I consists of seven domains in which the risk of bias is classified as being “low”, “moderate”, “serious” or “critical.” These domains are: bias due to confounding; bias in selection of participants into the study; bias in classification of interventions; bias due to deviations from intended interventions; bias due to missing data; bias in measurement of outcomes; and bias in selection of the reported result [12].

Statistical analysis

The statistical analysis was conducted using Review Manager software, version 5.4.1. The standardized mean difference (SMD) was used to evaluate the non-binary study endpoints, and the confidence interval used was 95%. Group estimates were evaluated using the random effects model. Heterogeneity was assessed using the I^2 statistic and Cochran's Q test for heterogeneity (chi-square test). I^2 values $>30\%$ and p -values <0.10 were considered significant for heterogeneity.

Variables

The instruments used in the studies were: the EORTC Core Quality of Life Questionnaire (QLQ-C30), the Medical Outcomes Study (MOS) 36-Item Short-Form Health Survey (SF-36), the Quality of Life Instrument - Breast Cancer Patient version (QOL-BC) and Functional Assessment of Chronic Illness Therapy General Questionnaire, including Breast Cancer Supplement (FACT-B). The outcomes evaluated in this study are topics common to all the quality of life evaluation tools used in these studies: overall health status, physical functioning, social functioning and emotional functioning.

Of the twelve studies included here, five conducted pre and post-intervention comparisons. In those cases, the results of the pre-intervention analysis were used as a control group [11, 14-17]. In the other seven studies, a control group was compared with an intervention group [18-24].

Results

The database search revealed 14,675 studies (Figure 1). After excluding duplicate articles and screening the titles and abstracts, 21 papers were selected for reading in their entirety, and the inclusion and exclusion criteria were applied. This resulted in the inclusion of twelve articles involving 867 patients, with 669 women (77.2%) having been submitted to mastectomy and 184 (21.2%) to quadrantectomy. The characteristics of the patients and studies are described in Table 1. Most of the studies were classified as having a low risk of bias (Table S1).

In relation to the overall health status of the patients evaluated, a significantly better outcome was found for those who underwent kinesiotherapy following breast cancer surgery (SMD 0.45; 95%CI: 0.09-0.82; $p=0.01$; $I^2=75\%$) (Figure 2). Of the studies in which that endpoint was evaluated, only three failed to obtain statistically significant results [11, 19, 22]. Comparing the physical functioning scale of the studies evaluated, a statistically significant benefit was also found for the patients who practiced kinesiotherapy (SMD 0.89; 95%CI: 0.39-1.39; $p=0.0005$; $I^2=91\%$) (Figure 3). The nine studies that evaluated this specific endpoint reported better data in favor of the kinesiotherapy group.

Results also showed a statistically significant benefit in the intervention groups when patients' social functioning was evaluated (SMD 0.67; 95%CI: 0.26-1.09; $p=0.001$; $I^2=89\%$) (Figure 4). Among the nine studies that evaluated social functioning, five showed statistical relevance in favor of kinesiotherapy. Emotional functioning also obtained a significant result in favor of kinesiotherapy (SMD 0.90; 95%CI: 0.40-1.40; $p=0.0004$; $I^2=92\%$) (Figure 5).

Discussion

The surgical treatment of breast cancer can result in various sequelae that exert a negative effect on patients' quality of life [25]. In this systematic review and meta-analysis of twelve articles involving a total of 867 patients, women who performed kinesiotherapy following

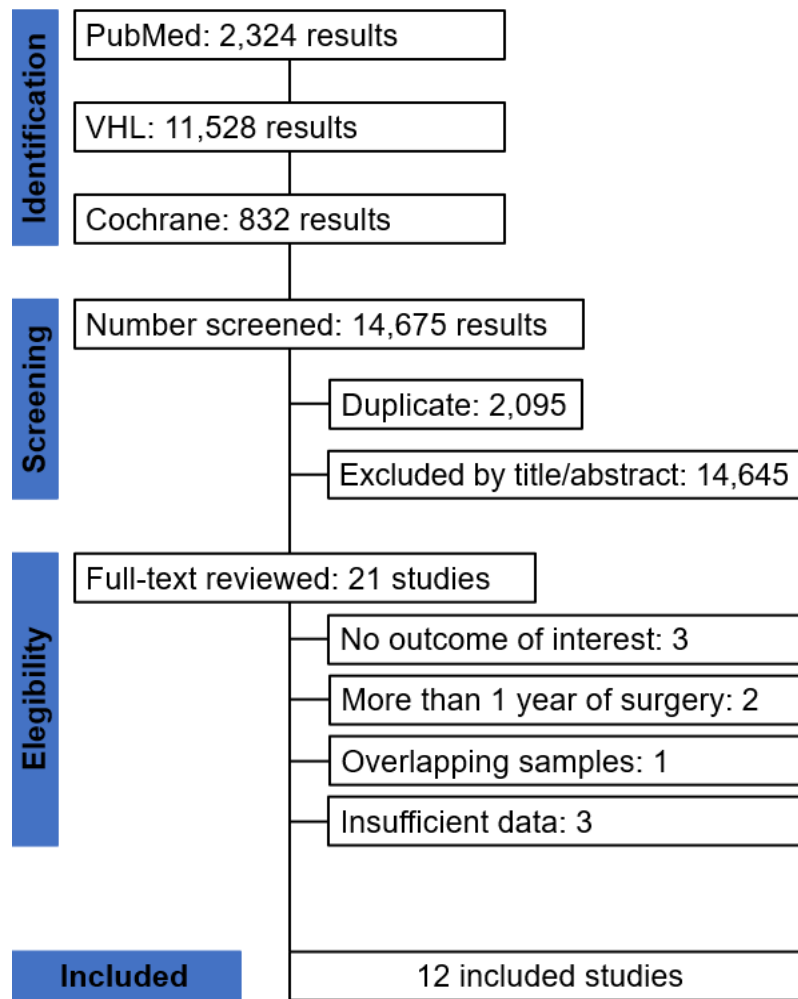


Figure 1. PRISMA Flow Diagram of Study Screening and Selection. The search strategy in PubMed, Virtual Health Library (VHL), and Cochrane databases yielded 12,580 studies, of which 21 were fully reviewed based on the inclusion and exclusion criteria. A total of twelve studies were included in the meta-analysis.

breast cancer surgery were compared to women who did not, with the objective of evaluating the effects of that therapy on quality of life. The main results of this research were: 1) significantly better results in the evaluation of overall health status for the kinesiotherapy group; 2) statistically significant results for the endpoints of physical functioning, social functioning and emotional functioning in favor of the intervention group.

Important results were found with kinesiotherapy in this population when the endpoint evaluated was overall

health status, which reflects mobility and self-care as well as the performance of activities of daily living and other activities. Therefore, the improvement in overall health status may reflect the final sum of the various domains associated with quality of life, particularly physical aspects that facilitate the daily life of these patients. In the meta-analysis conducted by Kannan et al. [26], the physical exercise was found to be beneficial when the quality of life and the level of pain were evaluated in patients with post-mastectomy pain syndrome. In the study conducted

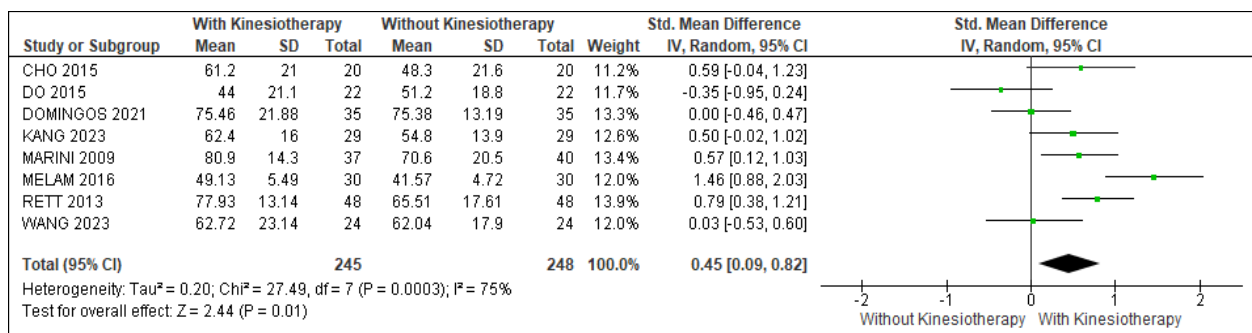


Figure 2. Group that Underwent Kinesiotherapy Obtained Better Results on the Overall Health Scale Compared to those that did not Perform It (p = 0.01).

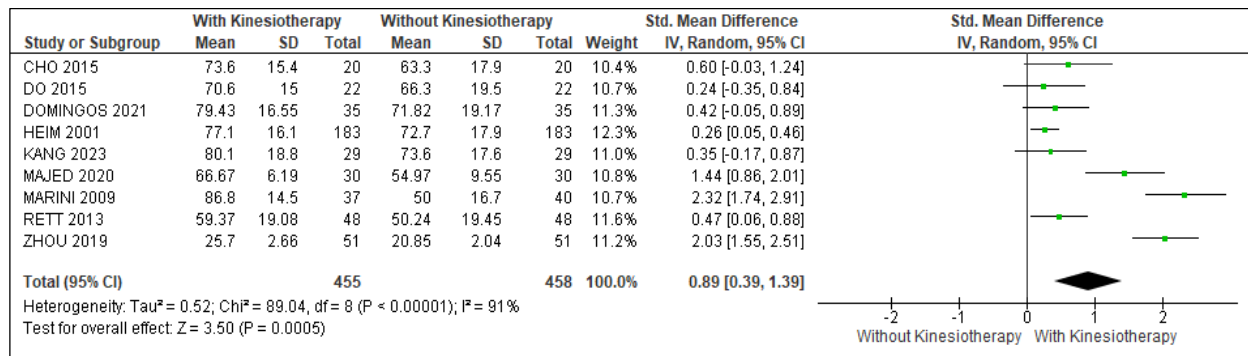


Figure 3. Group that Underwent Kinesiotherapy Obtained Better Results on the Physical Functioning Scale Compared to those that did not Perform It (p = 0.0005).

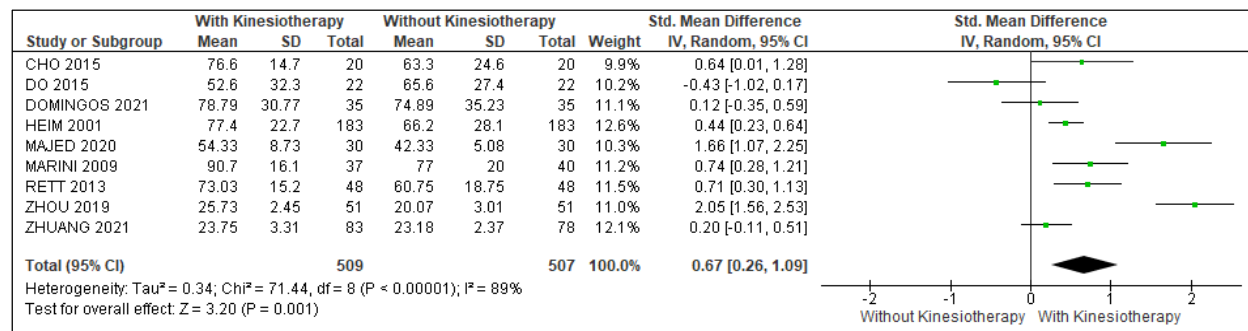


Figure 4. Group that Underwent Kinesiotherapy Obtained Better Results on the Social Functioning Scale Compared to those that did not Perform it (p = 0.001).

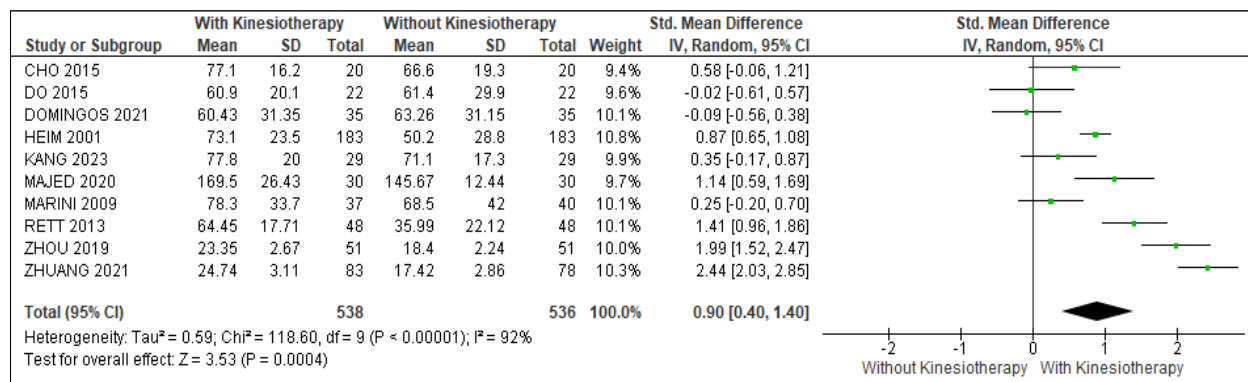


Figure 5. Group that Underwent Kinesiotherapy Obtained Better Results on the Emotional Functioning Scale Compared to those that did not Perform it (p = 0.0004).

by Wilson, [27], kinesiotherapy was able to significantly reduce pain and improve range of motion in patients submitted to breast cancer surgery. These findings suggest that this therapy of movement yields results that go beyond an improvement in patients' physical status following surgery, improving the general health of this population.

With respect to quality of life and physical functioning and social functioning endpoints, kinesiotherapy yielded statistically significant results in relation to the control group. This is probably due to the fact that the physical exercise involved in the therapy promotes an increase in muscle strength and an improvement in patients' range of motion. In the study conducted by Majed et al. [20], range of motion in the affected upper limb of mastectomy patients was evaluated prior to and following

kinesiotherapy with significant positive results. Indeed, with the improvement in mobility and in the strength of the upper limbs, patients are able to return to their activities of daily living, and their self-perceived quality of life tends to improve [28].

In relation to emotional functioning and quality of life, important data were found that favor the intervention group. Among the ten studies that evaluated this outcome, five found very significant results in favor of kinesiotherapy. An improvement in depression was also observed with kinesiotherapy, a result that converges with the findings of the present study [29]. Taken together, these data are possibly due to the global effect of physical activity on the mental health and self-esteem of individuals, especially in the post-operative period.

Table 1. Characteristics of the Patients and Studies Included in the Meta-Analysis

	CHO 2015 n = 20	DO 2015 n = 44	DOMINGOS 2021 n = 35	HEIM 2001 n = 183	KANG 2023 n = 29	MARINI 2009 n = 77	MAJED 2020 n = 60	MELAM 2016 n = 60	RETT 2013 n = 48	WANG 2023 n = 48	ZHOU 2019 n = 102	ZHUANG 2021 n = 161	
Type of surgery n (%)	M 16 (80) Q 3 (15) BR 1 (5)	M 21 (47.7) Q 20 (45.5) BR 3 (6.8)	M 25 (71.4) Q 10 (28.7)	M 84 (46) Q 90 (49) BR 6 (3)	M 29 (100)	M 46 (59.7) Q 31 (40.2)	M 60 (100)	M 60 (100)	M 38 (79.1) Q 10 (20.8)	M 48 (100)	M 81 (79.4) Q 20 (20.6)	M 161 (100)	
Age Mean (±SD)	50.7 (±9.6)	1 49.7 (±7.05) C 49.6 (±10.35)	51.74 (±13.8)	NS	48.1 (±7.9)	1 59.5 (10.5) C 58.7 (11.4)	NS	1 56 (3.5) C 56.3 (3.3)	50.2 (±11.3)	1 53.9 (3.78) C 56.04 (4)	49.7 (± 9.32)	1 51 (7.94) C 51.84 (8.23)	
Body mass index n (%)	≥25.9 (45) <25.11 (55)	≥25.6 (13.6) <25.38 (86.4)	Mean (±SD) 27.32 (±4.1)	NS	≥25.12 (41.4) <25.17 (58.6)	NS	NS	NS	Mean (±SD) 27.3 (±5)	NS	NS	NS	
Side operated on n (%)	Right 11 (55) Left 9 (45)	NS	Right 15 (42.8) Left 20 (57.1)	NS	NS	Right 41 (53.2) Left 36 (46.7)	NS	D 29 (48) ND 11 (18)	Right 21 (43.7) Left 27 (56.2)	NS	NS	Right 77 (48) Left 84 (52)	
Chemotherapy n (%)	Yes 11 (55) No 9 (45)	Yes 34 (77.3) No 10 (22.7)	Neo 14 (40) Adj 1.8 (5.14)	NS	NS	NS	NS	NS	Neo 6 (25) Adj 20 (83.3)	NS	Yes 84 (82.4) No 18 (17.6)	124 (77)	
Radiotherapy n (%)	Yes 19 (95) No 1 (5)	NS	Neo 2 (5.7) Adj 1.8 (5.14)	NS	NS	NS	NS	NS	Neo 1 (4.5) Adj 21 (95.4)	NS	NS	101 (62.7)	
Endpoints evaluated	Overall health status;	Overall health status;	Overall health status;	Physical functioning;	Overall health status;	Overall health status;	Physical functioning;	Overall health status;	Overall health status;	Overall health status;	Overall health status;	Physical functioning;	Social functioning;
	Physical functioning;	Physical functioning;	Physical functioning;	Social functioning;	Physical functioning;	Physical functioning;	Social functioning;	Overall health status;	Physical functioning;	Overall health status;	Overall health status;	Physical functioning;	Social functioning;
	Social functioning;	Social functioning;	Social functioning;	Emotional functioning	Emotional functioning;	Emotional functioning;	Emotional functioning;	Emotional functioning	Social functioning;	Emotional functioning;	Emotional functioning;	Emotional functioning	Emotional functioning
Evaluation instrument	QLQ-C30	QLQ-C30	QLQ-C30	QLQ-C30	QLQ-C30	SF-36	QOL-BC	QLQ-C30	SF-36	QLQ-C30	FACT-B	NS	

Adj, adjuvant; BR, breast reconstruction; C, control; D, dominant; FACT-B, Functional Assessment of Chronic Illness Therapy General Questionnaire, including Breast Cancer Supplement; I, intervention; M, mastectomy; ND, non-dominant; Neo, neoadjuvant; NS, not specified; Q, quadrantectomy; QLQ-C30, EORTC Core Quality of Life Questionnaire; QOL-BC, Quality of Life Instrument-Breast Cancer Patient Version; SF-36, MOS 36-Item Short Form Survey.

This meta-analysis found significant heterogeneity between the studies. This finding could be explained as a function of the different scales used to evaluate quality of life (SF-36, QLQ-30, QOL-BC, FACT-B). The SF-36 is a 36-item questionnaire that evaluates health-related quality of life in general, with domains related to overall health, physical aspects, social aspects, emotional aspects, vitality and mental health. Although validated in different populations, it is not intended specifically for breast cancer patients [30]. Nevertheless, the two studies that used the SF-36 reported favorable results for kinesiotherapy in almost all the domains, with the exception of emotional functioning in the study conducted by Marini et al. [18] [17,28].

The QLQ-C30 and QOL-BC are questionnaires specifically intended for use with cancer patients. The QLQ-C30 is used for cancer patients in general. In addition to the domains associated with overall health status and physical, emotional and social aspects, this 30-item questionnaire also includes cancer-related domains such as characteristics associated with treatment, the surgery, how the patient felt after her diagnosis and how the family reacted following diagnosis of the disease [31]. Nevertheless, the only studies in which no benefit was found for any of the four endpoints analyzed used that questionnaire [11,19].

The QOL-BC is a questionnaire exclusively intended for use with breast cancer patients, with domains specifically related to the disease. These include: body image; whether the patient experiences any pain or discomfort in the affected breast; her perception regarding hair loss; and social, emotional and physical aspects evaluated over treatment and following diagnosis [32]. However, only one study included in this meta-analysis used the QOL-BC and in that study the results favored the use of kinesiotherapy [20]. In addition to the scales mentioned, one article used the FACT-B questionnaire, which has 37 questions divided into two parts: a general scale and a specific scale for breast cancer [33]. Taken together, these differences between the instruments used to evaluate quality of life could explain the increase in heterogeneity of the results obtained in the combined analysis.

Therefore, the high heterogeneity found could be explained by the lack of standardization of the techniques, methodologies and questionnaires used in the studies included in the meta-analysis. On the other hand, although some studies compared patients before and after the intervention while others compared an intervention group to a control group, both cases permitted independent analysis. In relation to the questionnaires, although they involve different characteristics and scoring systems, the three are in agreement on the majority of the aspects and domains evaluated. To the best of our knowledge, this meta-analysis is pioneering in its approach to this subject and the results found give strength to the importance of kinesiotherapy in clinical practice and on the quality of life of women submitted to surgical treatment of breast cancer.

In conclusion, kinesiotherapy had a positive effect on the outcomes of overall health status and physical, social and emotional functioning compared to controls.

Therefore, kinesiotherapy appears to help recover quality of life in patients submitted to surgery for breast cancer.

Author Contribution Statement

All authors contributed to the selection of included articles, statistical analysis, writing of the manuscript and review of the final text.

Acknowledgements

Ethics statement

The Ethics Committee of Federal University of Goiás, Brazil, approved the study protocol.

Availability of data

The data that support the findings of this study are available in the original articles.

Record in the dataset

This meta-analysis was registered in PROSPERO with registration protocol: CRD42023410480.

Conflict of interest

The authors declare that they have no competing interests; neither financial nor non-financial interests.

References

1. National Comprehensive Cancer Network (NCCN). NCCN clinical practice guidelines in oncology: breast cancer [Internet]. Fort Washington, PA: NCCN; 2023. Available from: https://www.nccn.org/professionals/physician_gls.
2. Freitas-Júnior R, Gagliato DM, Moura Filho JWC, Gouveia PA, Rahal RMS, Paulinelli RR, et al. Trends in breast cancer surgery at Brazil's public health system. *J Surg Oncol*. 2017;115(5):544-9. <https://doi.org/10.1002/jso.24572>.
3. Jonczyk MM, Jean J, Graham R, Chatterjee A. Surgical trends in breast cancer: a rise in novel operative treatment options over a 12 year analysis. *Breast Cancer Res Treat*. 2019;173(2):267-74. <https://doi.org/10.1007/s10549-018-5018-1>.
4. Wang Z, Han X. Clinical significance of breast-conserving surgery for early breast cancer and its impact on patient life quality of life. *J BUON*. 2019;24(5):1898-04.
5. De la Cruz Ku G, Karamchandani M, Chambergo-Michilot D, Narvaez-Rojas AR, Jonczyk M, Príncipe-Meneses FS, et al. Does Breast-Conserving Surgery with Radiotherapy have a Better Survival than Mastectomy? A Meta-Analysis of More than 1,500,000 Patients. *Ann Surg Oncol*. 2022;29(10):6163-88. <https://doi.org/10.1245/s10434-022-12133-8>.
6. Kooijman MML, Hage JJ, Oldenburg HSA, Stouthard JM, Woerdeman LAE. Surgical Complications of Skin-Sparing Mastectomy and Immediate Implant-Based Breast Reconstruction in Women Concurrently Treated With Adjuvant Chemotherapy for Breast Cancer. *Ann Plast Surg*. 2021 Feb 1;86(2):146-50. <https://doi.org/10.1097/SAP.0000000000002435>.
7. Galimberti V, Vicini E, Corso G, Morigi C, Fontana S, Sacchini V, et al. Nipple-sparing and skin-sparing mastectomy: Review of aims, oncological safety and contraindications. *Breast*. 2017;34(Suppl 1):S82-S84. <https://doi.org/10.1016/j.breast.2017.06.034>.
8. Sue GR, Sun BJ, Lee GK. Complications After Two-Stage

- Expander Implant Breast Reconstruction Requiring Reoperation: A Critical Analysis of Outcomes. *Ann Plast Surg.* 2018;80(5S Suppl 5):S292-4. <https://doi.org/10.1097/SAP.0000000000001382>.
9. Al-Hilli Z, Wilkerson A. Breast Surgery: Management of Postoperative Complications Following Operations for Breast Cancer. *Surg Clin North Am.* 2021 Oct;101(5):845-63. <https://doi.org/10.1016/j.suc.2021.06.014>.
 10. Mokhtari-Hessari P, Montazeri A. Health-related quality of life in breast cancer patients: review of reviews from 2008 to 2018. *Health Qual Life Outcomes.* 2020;18(1):338. <https://doi.org/10.1186/s12955-020-01591-x>.
 11. Domingos, HYB, Moreira, SS, Alves, MS, Oliveira, FB, Da Cruz, CBL, Silva, MDS, et al. Cinesioterapia para melhora da qualidade de vida após cirurgia para câncer de mama. *Fisioter Bras.* 2021;22(3):385-97.
 12. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ.* 20;355:i4919. <https://doi.org/10.1136/bmj.i4919>.
 13. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ.* 2019;366:l4898. doi: 10.1136/bmj.l4898.
 14. Cho Y, Do J, Jung S, Kwon O, Jeon JY. Effects of a physical therapy program combined with manual lymphatic drainage on shoulder function, quality of life, lymphedema incidence, and pain in breast cancer patients with axillary web syndrome following axillary dissection. *Support Care Cancer.* 2016;24(5):2047-57. <https://doi.org/10.1007/s00520-015-3005-1>.
 15. Heim ME, Kunert S, Ozkan I. Effects of inpatient rehabilitation on health-related quality of life in breast cancer patients. *Onkologie.* 200;24(3):268-72. English, German. <https://doi.org/10.1159/000055090>.
 16. Kang JJ, Lee H, Park BH, Song YK, Park SE, Kim R, et al. Efficacy of a 4-Week Nurse-Led Exercise Rehabilitation Program in Improving the Quality of Life in Women Receiving a Post-Mastectomy Reconstruction Using the Motiva Ergonomix™ Round SilkSurface. *Int J Environ Res Public Health.* 2022 Dec 20;20(1):16. <https://doi.org/10.3390/ijerph20010016>.
 17. Rett MT, Mendonça ACR, Santos RMVP, de Jesus GKS, Prado VM, DeSantana JM. Fisioterapia no pós-operatório de câncer de mama: um enfoque na qualidade de vida. *ConScientiae Saúde.* 2013;12(3):392-7. <https://doi.org/10.5585/conssaude.v12n3.4341>
 18. Marini, G, Barbosa, AMP, Assis, LCD, Rudge, MVC. Interferência da fisioterapia na qualidade de vida de mulheres submetidas à cirurgia de mastectomia ou cirurgia conservadora. *Fisioter. Bras.* 2009;10(3):165-9.
 19. Do JH, Kim W, Cho YK, Lee J, Song EJ, Chun YM, et al. Effects of resistance exercises and complex decongestive therapy on arm function and muscular strength in breast cancer related lymphedema. *Lymphology.* 2015;48(4):184-96.
 20. Majed M, Neimi CA, Youssef SM, Takey KA, Badr LK. The Impact of Therapeutic Exercises on the Quality of Life and Shoulder Range of Motion in Women After a Mastectomy, an RCT. *J Cancer Educ.* 2020;37(3):843-51. <https://doi.org/10.1007/s13187-020-01894-z>.
 21. Melam GR, Buragadda S, Alhusaini AA, Arora N. Effect of complete decongestive therapy and home program on health-related quality of life in post mastectomy lymphedema patients. *BMC Womens Health.* 2016;16:23. <https://doi.org/10.1186/s12905-016-0303-9>.
 22. Wang TC, Chang PH, Chen WH, Hung CC, Chen JP, Lin YC, et al. The Effectiveness of an Upper Limb Rehabilitation Program on Quality of Life in Breast Cancer Patients after Mastectomy: A Randomized Controlled Trial. *Semin Oncol Nurs.* 2023;39(6):151-12. <https://doi.org/10.1016/j.soncn.2023.151512>.
 23. Zhou K, Wang W, An J, Li M, Li J, Li X. Effects of Progressive Upper Limb Exercises and Muscle Relaxation Training on Upper Limb Function and Health-Related Quality of Life Following Surgery in Women with Breast Cancer: A Clinical Randomized Controlled Trial. *Ann Surg Oncol.* 2019;26(7):2156-65. <https://doi.org/10.1245/s10434-019-07305-y>.
 24. Zhuang Y, Pan Z, Li M, Liu Z, Zhang Y, Huang Q. The effect of evidence-based nursing program of progressive functional exercise of affected limbs on patients with breast cancer-related lymphoedema. *Am J Transl Res.* 2021;13(4):3626-33.
 25. de Assis Lahoz M, Nyssen SM, Correia GN, Urdiales AP, Driusso G. Capacidade funcional e qualidade de vida em mulheres pós-mastectomizadas. *RBC.* 2010;56(4):423-30. <https://doi.org/10.32635/2176-9745.RBC.2010v56n4.1463>
 26. Kannan P, Lam HY, Ma TK, Lo CN, Mui TY, Tang WY. Efficacy of physical therapy interventions on quality of life and upper quadrant pain severity in women with post-mastectomy pain syndrome: a systematic review and meta-analysis. *Qual Life Res.* 2022;31(4):951-73 <https://doi.org/10.1007/s11136-021-02926-x>.
 27. Wilson DJ. Exercise for the Patient after Breast Cancer Surgery. *Semin Oncol Nurs.* 2017;33(1):98-105. <https://doi.org/10.1016/j.soncn.2016.11.010>.
 28. Rett MT, Oliveira IAD, Mendonça ACR, Biana CB, Moccellini AS, De Santana JM. Physiotherapeutic approach and functional performance after breast cancer surgery. *Fisioter Mov.* 2017;30(3): 493-500.
 29. Giron PS, Haddad CA, Lopes de Almeida Rizzi SK, Nazário AC, Facina G. Effectiveness of acupuncture in rehabilitation of physical and functional disorders of women undergoing breast cancer surgery. *Support Care Cancer.* 2016;24(6):2491-6. <https://doi.org/10.1007/s00520-015-3054-5>.
 30. Ciconelli RM, Ferraz MB, Santos W, Meinão I, Quaresma MR. Tradução para língua portuguesa e validação do questionário genérico de qualidade de vida SF-36 (Brasil SF-36). *Rev Bras Reumatol.* 1999;39(3): 143-50.
 31. Sprangers MA, Groenvold M, Arraras JI, Franklin J, te Velde A, Muller M, et al. The European Organization for Research and Treatment of Cancer breast cancer-specific quality-of-life questionnaire module: first results from a three-country field study. *J Clin Oncol.* 1996;14(10):2756-68. <https://doi.org/10.1200/JCO.1996.14.10.2756>.
 32. Michels FA, Latorre Mdo R, Maciel Mdo S. Validity, reliability and understanding of the EORTC-C30 and EORTC-BR23, quality of life questionnaires specific for breast cancer. *Rev Bras Epidemiol.* 2013;16(2):352-63. <https://doi.org/10.1590/S1415-790X2013000200011>.
 33. Di Bella O, Cocchiara RA, De Luca A, Frusone F, Aceti V, Sestili C, et al. Functional Assessment of Cancer Therapy Questionnaire for Breast Cancer (FACT-B+4): Italian version validation. *Clin Ter.* 2018;169(4):e151-e154. <https://doi.org/10.7417/T.2018.2071>.



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