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REVIEW

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Quality of life in male breast cancer patients: psychosocial impacts and therapeutic strategies

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Abstract

Male breast cancer (MBC) is a rare malignant tumor that is infrequently diagnosed in men. This leads to a lower quality of life (QOL) in men adversely affecting their overall well-being. Therefore, we aimed to summarize and disseminate the evidence on the impact of breast cancer treatment on men's QOL. Following scoping review guidelines, we conducted a scoping review by searching PubMed, Web of Science, Embase, Academic Search Ultimate, Medline and Google Scholar using keywords such as "breast cancer", "male breast cancer", "male breast cancer treatment" and "male breast cancer prevention", combined with terms like "quality of life", "complications", "recurrence" and "metastasis". Out of 308 results, 13 articles met our inclusion criteria after removing duplicates, irrelevant titles and non-English publications, focusing on studies published between 2010 and 2024. Evidence related to the impact of breast cancer on men's QOL was grouped into three themes: (1) decreased survival due to metastases to other bodies after breast cancer treatment, (2) local recurrence of the tumor or development of complications, and (3) decreased QOL due to psychosocial problems in men after breast cancer treatment. Studies show that even after breast cancer treatment, men remain at risk for tumor metastasis and may experience anxiety overcomplications, local recurrence and psychosocial concerns about body image and life expectancy. In treatment of MBC, the development of new therapies and chemotherapy regimens that creduce the risk of metastasis, complications and local recurrence is crucial for improving the QOL of patients suffering from MBC.

Keywords

Male breast cancer; Quality of life; Men's health; Psychosocial problems; Treatment; Chemotherapy

1. Introduction

The National Cancer Database (2004–2014) has identified 19,795 patients with male breast cancer (MBC) [1]. The incidence rate of MBC is estimated to be 1.2 cases per 100,000 men annually, reflecting an ongoing increase in incidence [2]. Although it is a rare disease with a global prevalence of less than 1%, its incidence continues to increase [3]. According to surveillance, epidemiology and end results (SEER), from 1975 to 2015, the incidence of breast cancer in men increased by 40%, exceeding the incidence in women by 25% [4]. The American cancer society estimated that 2670 new cases of MBC were diagnosed in the United States in 2019, with a mortality rate of 18% [5]. According to the most recent data, the mortality rate for MBC has risen to approximately 54.2%, highlighting the need for continued vigilance in patient monitoring [6].

Unlike female breast cancer (FBC), MBC is extremely rare, though diagnosis and treatment are crucial, ongoing patient monitoring and follow-up are equally important [7]. Klinefelter syndrome, breast carcinoma (*BRCA1* or *BRCA2*) gene mutations, and a family history of breast cancer are risk factors for MBC. However, most patients do not exhibit clear symptoms, which can lead to delayed diagnosis and progression of the disease. MBC is rarely observed in men and is painless [8]. It presents with symptoms and signs similar to those of FBC and is diagnosed and treated in a similar manner as in women. Diagnosis of MBC may involve detecting a palpable lump, enlarged lymph nodes and skin changes, along with imaging techniques such as mammography and ultrasonography. A biopsy provides the final confirmation [9]. However, there are significant differences between MBC and FBC, and research focused on MBC is needed. Unlike FBC, prospective clinical trials for this MBC have not been conducted for decades [10]. MBC is associated with a higher risk of low sex hormone androgen status and is more likely to occur with BRCA2 mutations. This differs from FBC, which has a higher proportion of estrogen receptor-positive (ER^+) tumors and is frequently associated with BRCA1 mutations [11]. In the context of male breast cancer, testosterone and other androgens play a

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significant role. The externalizing effects of testosterone can influence the development of breast cancer in men, particularly when the androgen receptor (AR) is abnormally activated or overexpressed [12]. The androgen receptor functions by binding to testosterone and other androgens, regulating gene expression that can either promote or inhibit cancer cell growth [13]. Other potential risk factors for MBC include age, genetics hormone imbalances (estrogen and testosterone), obesity, coronary artery disease, infectious disease, lifestyle, inadequate exercise, radiation exposure, exposure to electromagnetic fields or volatile organic compounds, bone fractures occurring after 45 years of age, and other potential factors such as genetic abnormalities present at birth [14]. An abnormal androgen-to-estrogen ratio, which can result from factors like obesity, aging or genetic predispositions, may lead to increased aromatization of androgens to estrogens [15]. This shift can contribute to an environment conducive to breast cancer development, as the excess estrogen stimulate breast tissue growth, similar to how estrogen affects breast cancer development in women [16]. Genetic factors specifically associated with MBC include family history and BRCA2 mutations. Furthermore, potential genetic factors also involve PALB2 (partner and localizer of BRCA2), androgen receptor, CYP17 (cytochrome P450 17α-hydroxylase), CHEK2 (checkpoint kinase 2) and an abnormal androgen-to-estrogen ratio [17].

Because breast cancer is generally considered a female disease, leading to less tailored information and support for men. Men suffer from hidden mastectomy scars, chemotherapy side effects and hair loss. Additionally, men may feel that their needs are overlooked in the treatment of MBC, as disease treatment and procedures are focused on women [18]. In response, patients with MBC have emphasized the need for male-specific psychosocial support and have shown strong interest in receiving information about post-treatment breast care options for men, rather than those primarily focused on women [19]. Psychological health is a major factor in determining the quality of life (QOL) of patients with MBC. It includes pain, physical symptoms, and body image and is a holistic consideration of physical and psychosocial aspects that comprise the QOL of patients with MBC [20]. This study provides a direction for approaches to support men diagnosed with MBC in relation to the link between their treatment and its subsequent impact on their physical and psychological circumstances experienced by men. We identified future directions for MBC research and presented evidence on the impact of MBC treatment on men's quality of life based on a scoping review of literature from 2010 to 2024.

2. Methods

Representative studies were identified through an extensive search of relevant research publications using the scoping review methodology developed by Arksey and O'Malley (2005) [21]. Web-based databases including PubMed, Web of Science, Embase, Academic Search Ultimate, Medline and Google Scholar were used to search for and extract articles, review articles and related information. The search was conducted using the keywords "breast cancer", "male breast cancer", "male breast cancer treatment" and "male breast cancer prevention" (Fig. 1). The search results were refined with Boolean operators with the terms "quality of life", "complications", "recurrence*" and "metastasis*". This

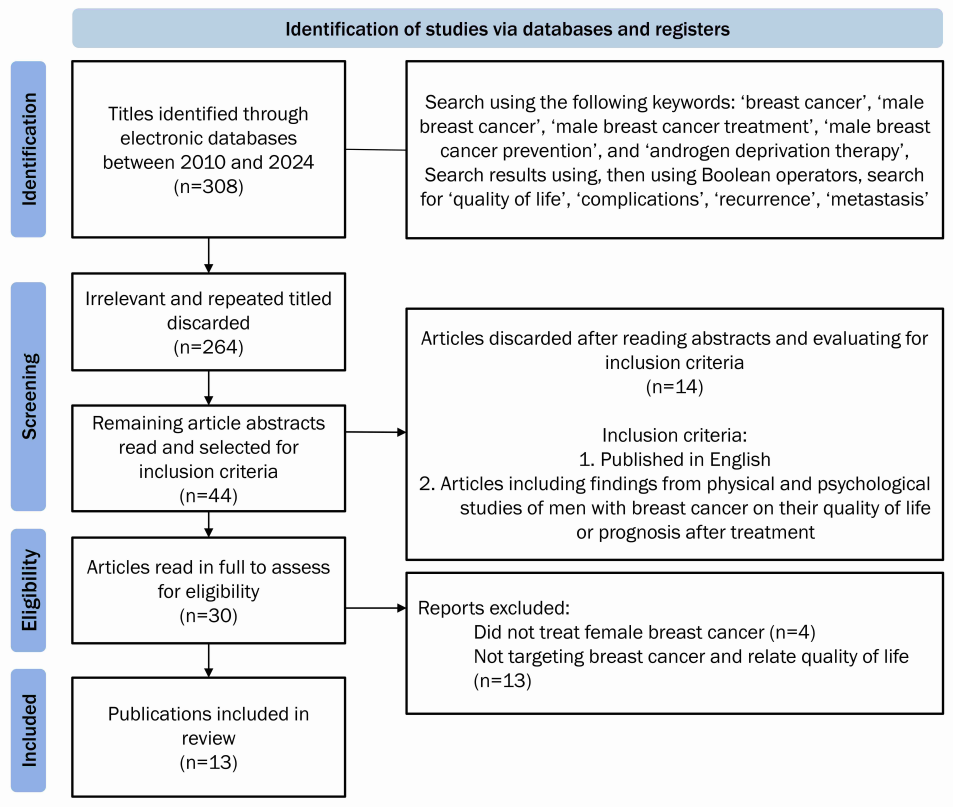

FIGURE 1. Flow diagram of the article inclusion/exclusion process.

search strategy yielded 308 results. The search was conducted in January 2024.

Irrelevant and repeated titles were excluded (n = 264). Abstracts were screened for the following inclusion criteria: articles were considered if they (1) were published in English between 2010 and 2024 and (2) included findings from physical and psychological studies of men's quality of life or post-treatment prognosis in patients with breast cancer. However, we excluded reviews, internet articles, editorials, perspectives, commentaries, position papers, reports and articles with language restrictions, as well as those with irrelevant or inappropriate topics (n = 44). This resulted in the inclusion of 13 articles in the scoping review.

Only outcomes related to metastasis, complications or recurrence of MBC and follow-up were considered in the current analysis. In addition, four papers included studies conducted in Asia [22–25], however, only those with clinical trial results or quantitative analyses pertinent to our analysis were considered. To map the current state of knowledge on the association between MBC, its treatment, and the quality of life, we extracted key findings from each article and summarized them in a table (**Supplementary Table 1**). The analysis involved (1) comparing results across papers, (2) identifying and organizing categories across research findings, and (3) summarizing the categories into overarching themes.

3. Results

Seventeen articles reported qualitative or quantitative findings. The study sample sizes ranging from 1 to 16,025 participants. These studies were conducted in Japan (n = 1), the Republic of Korea (n = 1), China (n = 2), Germany (n = 2), Canada (n = 1), and the USA (n = 6). The reviewed articles included clinical trials, database analyses, and questionnaires. The themes of (1) metastasis of MBC, (2) cases of local recurrence and complications after MBC treatment, and (3) the impact of body image and psychological status on the quality of life of patients with MBC after treatment are implicit in the reviewed literature.

3.1 Metastasis after MBC treatment

Because MBC is typically detected later than FBC, it is more likely to have a large tumor size, lymph node invasion, or metastasis to various parts of the body, including the lungs, spine, liver and central nervous system [26–28]. These disease characteristics are influenced by estrogen receptors (ER), progesterone receptors (PR) and androgen receptors (AR) in men [29]. Generally, breast cancer can present through the skin following treatment, showing symptoms such as skin changes or ulceration [30]. Mucinous carcinoma of the male breast is an extremely rare malignant breast neoplasm. It grows gradually and rarely metastasizes to the lymph nodes. Its gelatinous appearance and soft consistency require mastectomy and nodal dissection. Therefore, early detection of suspected mucinous carcinoma by clinical examination is important [31]. Among the 1012 patients with confirmed human epidermal growth factor receptor 2 (HER2)-positive tumors, 377 (37.3%) were diagnosed with MBC metastasis to the central nervous system (CNS). This suggests that younger patients are more likely to have hormone receptor-negative disease, which is associated with a higher disease burden. Metastases to the CNS have been associated with prolonged overall survival (OS) when treated with radiotherapy; however, the difference compared to chemotherapy was not significant [32]. Cases of breast cancer metastasizing to the oral cavity have been reported. Although rare, metastasis to the oral and maxillofacial regions can occur in elderly male patients or those with a history of malignancy. It is often presented as a reddish oral nodule [33].

3.2 Complications and local recurrence of MBC

Tamoxifen is an effective endocrine therapeutic agent for the treatment of MBC. However, it often causes side effects and lead to non-adherence in many men. Aromatase inhibitors (AIs) have also been reported to be less effective in this context [33]. Five studies reported complications and local recurrence of MBC [22, 23, 34–37]. Two qualitative studies found that a diagnosis of breast cancer in men often led to local recurrence, which can appear temporarily and then resolve spontaneously. However, this recurrence was also associated with significant psychological issues for patients, highlighting the need for robust psychosocial support to manage psychological stress. Additionally, adjuvant chemotherapy has been linked to complications, including toxicity, which further impacts men undergoing treatment [35]. Tamoxifen and anastrozole, common male breast cancer drugs, were reported to be associated with several negative complications, including decreased libido, weight gain, malaise, rash, erectile dysfunction, liver disease, pulmonary embolism, superficial thrombophlebitis, myalgia, depression, visual problems and stool disorders. In addition to age, chronic diseases, high blood pressure, and diabetes were also associated with a higher likelihood of breast cancer recurrence.

In terms of complications, with both quantitative and qualitative data showed that tamoxifen was associated with discontinuation in men owing to adverse events. In men, MBC is more commonly associated with pathogenic genetic mutations in BRCA1 and BRCA2. Practice recommendations include management with annual mammography for early detection and the consistent use of chemotherapy for treatment and management [38]. However, discontinuation of adjuvant chemotherapy can lead to spontaneous regression (SR). The biological phenomenon of tumor development by transient SR in breast cancer is as high as 1 in 60,000–100,000 cancer cases [22]. Although male patients are at a higher risk of complications and localized recurrence, Cho *et al.* [23]. found that MBC can also occur in younger individuals. The younger the patient, the greater the need for psychosocial support.

Tamoxifen treatment is a common chemotherapeutic treatment for benign breast cancer, but it also causes nonalcoholic fatty liver disease (NAFLD) as a common side effect. It is responsible for the mechanism of tamoxifen (TAM)-induced steatosis in the liver by increasing triglyceride (TG) synthesis and promoting co-transcription factor recruitment and dissociation of the liver X receptor/estrogen receptor/retinoid X receptor (LXR/ER/RXR) complex, leading to impaired hepatic

lipid metabolism [39]. Adjuvant endocrine therapy (AET), including tamoxifen and aromatase inhibitor (AI), which plays an important role in considerably improving survival in patients with hormone receptor-positive breast cancer, can cause complications. Symptoms include hot flashes, sexual problems, joint pain, stiffness, mood swings and fertility issues, particularly because AIs cause joint pain, stiffness, and bone health issues. Individualized and tailored strategies to improve adherence to these complications, increase treatment support, and promote quality of life are crucial for long-term patient care [40]. Similarly, considering the side effects and complications of chemotherapy and the risk of local recurrence in male patients with breast cancer, Masci *et al.* [37] demonstrated the safety and efficacy of trastuzumab. Recognizing the biological differences between MBC and FBC, we conducted a qualitative study to demonstrate that trastuzumab is an effective treatment for HER2-positive MBC patients. Concisely, trastuzumab is an effective chemotherapy with manageable toxicity in previously treated advanced gastric and breast cancer patients, and its safety has been confirmed in clinical practice [41]. Trastuzumab emtansine (T-DM1) is a new treatment option for patients with HER2-positive breast cancer, especially those resistant to conventional therapy. The development of trastuzumab deruxtecan (T-DXD) and sacituzumab govitecan (SG) has further broadened the applicability of antibody-drug conjugates (ADCs) in breast cancer treatment, offering new hope to patients with low HER2 expression and triple-negative breast cancer. However, prolonged treatment can lead to ADC resistance, complicating the treatment process [42].

3.3 Impact of breast cancer treatment on men's quality of life

While breast cancer is often associated with survival in men, it can also cause psychological stress and decrease the quality of life. Eight studies examined the impact of breast cancer on quality of life in men [24, 25, 43–48]. Although breast cancer is often considered a disease affecting only women, men are also at risk due to genetic variants. The interplay of these genetic variants, risk modifiers, and underlying genetic components in a multigene model contributes to poorer survival rates in men [49]. Furthermore, Yu *et al.* [24] found that the clinical characteristics of male breast cancer are associated with survival, with the 10-year OS rates and markedly lower HER2 expression being worse compared to postmenopausal values for FBC.

Breast cancer in men is relatively unfamiliar, due to its rarity and the lack of clinical trials, this results in a limited understanding of treatment options and a shortage of available information [50]. Breast-conserving surgery (BCS) is the primary treatment option for less aggressive MBC in the United States [44]. Unlike simple mastectomy, BCS is associated with less nipple necrosis, and is effective in preserving breast shape and minimizing complications. This non-invasive treatment is psychologically acceptable to patients and is often used for small lesions. BCS spares the nipple and as much of the breast as possible, removing only the tumor and a small margin of surrounding tissue. Less extensive tissue removal keeps circulation to the nipple and breast intact, reducing the risk of necrosis. However, Chichura *et al.* [43] found that male patients often chose lumpectomy over BCS, even though BCS can have similar outcomes to mastectomy. This indicates that there is still a lack of information regarding breast cancer treatment in men. Men who chose BCS appeared to have made a decision driven by strong discomfort with their appearance. Moreover, preserving body image can lead to higher surgical satisfaction in men, which, in turn, can lead to a better quality of life. Wang *et al.* [45] discussed quality of life from a male perspective, noting that men have a higher incidence of hormone-induced conditions and fewer clinical trials for breast cancer treatments compared to women. Consequently, adherence to breast cancer guidelines is generally lower in men, leading to a higher mortality rate compared to women. This suggests that male breast cancer (MBC) significantly impacts quality of life due to increased mortality. Additionally, men treated with chemotherapy experience higher mortality rates than women. Eggemann *et al.* [46] reported that 17.9% of patients treated with the leading breast cancer drug tamoxifen and 32% of patients treated with AIs died. Although the therapeutic efficacies of tamoxifen and AIs have been recognized, the associated mortality rate cannot be overlooked. Furthermore, Reinisch *et al.* [48] showed that the QOL was strongly associated with decreased estradiol and testosterone levels in sexual function and libido. However, even with the addition of gonadotropin-releasing hormone analogs (GnRHAs) to chemotherapy, estradiol and testosterone have been reported to decrease sexual function and libido compared with tamoxifen or AI alone. Nevertheless, the addition of GnRHA has been shown to increase survival in premenopausal women and emphasizes an endocrine approach that can preserve sexual function and libido in men. This endocrine approach, representing a chemotherapeutic drug treatment, is still under research and clinical trials for men.

Zhao *et al.* [25] emphasized the importance of combining adequate exercise with treatment, nothing that obesity can lead to a decrease in survival and QOL in patients with MBC. From a surgical perspective, it has been confirmed that men, like women, undergo breast reconstruction surgery to restore their body image and are generally satisfied with the results, which improves their QOL. Towfighi *et al.* [47] found that postoperative breast reconstruction in men is inherently difficult and leads to psychosocial problems. The majority of patients in their study were Caucasian (74%) or American (11%), indicating that their QOL was concerns about physical body image. Appearance plays a critical role in determining QOL of patients with breast cancer. Poor body image is strongly associated with changes in QOL, and patients are more likely to experience psychosocial, physical and functional problems [51]. This suggests that appearance concerns affect psychological well-being. It can lead to reduced self-esteem, decreased social engagement, and anxiety-depressive symptoms, all of which contribute to a poor QOL related to mental health. This is even more pronounced in adults, suggesting that targeted interventions should focus on addressing appearance-related concerns and monitoring psychological well-being [52].

4. Discussion

The results of this scoping review indicate that the impact of breast cancer treatment on men's QOL is significantly related to both their appearance and survival. This is primarily influenced by sex hormones, that affect various aspects of QOL. Despite the use of GnRH agonist (GnRHA) supplementation, men often experience a reduction in QOL due to decreased sexual function and libido. This situation parallels the experiences of women who undergo breast reconstruction surgery, and the choices men face between breast-conserving surgery (BCS) and mastectomy. Just as women may opt for breast reconstruction to improve their body image, men also weigh their options to balance treatment efficacy with the preservation of their physical appearance and overall well-being.

The selected literature revealed a lack of trials focused on specific treatments and aftercare for male breast cancer (MBC), indicating that guidelines for chemotherapy and breast cancer management in men are still in development. However, extensive research has been conducted on the importance and impact of breast cancer on men's psychological well-being [48, 53] and indirectly on breast reconstruction and BCS surgical choices [46, 47] which can help complement body image and provide a psychosocial complement to psychological well-being research for patients with MBC [54]. While evidence suggests that physical exercise, obesity prevention, and the use of tamoxifen or AIs, either alone or in combination with trastuzumab can improve the prognosis of MBC treatment and serve as adjuvant therapy [37, 48], the reviewed literature also highlights complications and local recurrence with tamoxifen and AIs [35, 36]. Additionally, MBC that develops at a younger age is associated with stronger psychosocial challenges [23], and even if chemotherapy is chosen alongside surgical treatment, discontinuing it may increase the risk of restart cancer recurrence [22]. However, we still need to consider the male predisposition in a psychosocial context, which is why most male patients choose ablation.

Although none of the reviewed studies examined the long-term impact of breast cancer treatment on men's quality of life (QOL) or the various factors contributing to it, it is evident that QOL is maintained through healthy survivorship and a positive body image. Breast cancer metastasis necessitates multiple treatments and is linked to increased mortality [18, 19, 32, 33]. Addressing men's survivorship issues is important to prepare them for the specific situations and conditions they face during follow-up after MBC treatment to manage their health and prolong their lives [55, 56]. Reports indicating that men have a poorer prognosis and higher mortality rates than women after breast cancer treatment highlight two clinical issues [24, 37].

First, breast cancer is biologically and clinically different in men and women, and treatment regimens for men should be studied and practiced separately from those for women. In addition, treatment guidelines designed for women should not be directly replicated for men, and a multidisciplinary approach encompassing physical, psychological, and psychosocial care is essential for men [57]. Second, by offering men the same range of choices regarding their appearance as women, detailed explanations and information from doctors can expend men's treatment choices and facilitate surgical body restoration along with follow-up care. Doctors have noted that men also experience negative psychological stress related to body image, particularly due to surgical scars or mastectomized breasts, which can result in reduced social engagement and self-esteem [58].

Men with breast cancer are more likely to experience lymphedema, difficulty with arm and shoulder mobility, sexual dysfunction, and hair loss and changes in sexual interest often result from cancer treatment, with sexual dysfunction continues as endocrine therapy continues. This affects approximately 71% or more of male patients [59]. Additionally, men's biggest fears fatigue and relapse, making it crucial to develop new natural product-based therapies that can reduce side effects. The fear of relapse is often tied to chemotherapy, as the risks of complications and relapse from secondary treatments remain interconnected. Patients with MBC often follow the same aftercare regimen as women, however, aftercare with GnRH analogs increases the risk of bone loss in men, and tamoxifen also causes common side effects, such as hot flashes [60]. Treatment strategies for male breast cancer patients include surgery, hormones and combined treatment regimens. Early detection is believed to improve survival rates, and the importance of randomized clinical trials for male patients with breast cancer has been consistently emphasized [61]. Further evaluation of male biological attributes and lifestyle factors, such as alcohol consumption, smoking, and body mass index, may lead to the development of targeted therapies and improved survival rates, thereby enhancing the QOL of patients with MBC. QOL includes physical, mental and social subdomains as well as sex-specific complication rates. This suggests that sex is a prognostic factor, and as women survive longer than men, improving the QOL of men needs to be based on improving survivorship [62].

Systemic treatment of male breast cancer emphasizes the use of targeted therapies, including cytotoxic, hormonal and immunotherapeutic agents. Drugs are used as adjuvant and neoadjuvant to treat metastases. However, resistance develops during treatment, with interactions involving host factors, tumors and drug-related P-glycoproteins and multidrug-resistant protein families. This underscores the need for new treatment strategies that integrate systemic therapy, surgery, and radiotherapy with new and effective chemotherapeutic, hormonal and biological agents [63]. Hormone receptors/progesterone receptors (ERs/PRs) help predict the treatment choices for metastatic diseases. HER2 is a targeted therapy for patients with MBC $HER2^{+}/ER^{+}$ or $HER2^{+}/ER^{-}$ MBC. It encompasses several compounds, such as trastuzumab and a tyrosine kinase inhibitor, lapatinib. Furthermore, HER2-targeted therapy has demonstrated efficacy in HER2-positive breast cancer [64]. Patients with metastatic or advanced MBC should receive endocrine therapy as the first-line treatment, and those with early disease should receive osteoporosis treatment to prevent bone degeneration. For MBC, tamoxifen is typically administered for 5 years, followed by gonadotropin/antigonadotropin and AIs if tamoxifen is contraindicated, and an additional 5 years of treatment if the risk of recurrence remains high despite initial therapy [38]. Additionally, Z-endoxifene is emerging as

a novel treatment for MBC. N-Desmethyltamoxifen (NDT), the primary tamoxifen metabolite, undergoes cytochrome P450 2D6 (CYP2D6)-dependent biotransformation to the secondary metabolite endoxifen. Endoxifene is a more potent antiestrogen than tamoxifen and exhibits significant anti-tumor activity. The active isomer, Z-endoxifene, is orally bioavailable and has demonstrated antitumor activity. Based on the clinicopathological features of MBC, cytotoxic chemotherapy and endocrine therapies, including tamoxifen, AIs and GnRH analogs, have a potential role as HER2 induction therapies or as targeted agents, such as poly (ADP-ribose) polymerase (PARP) inhibitors and angiogenesis inhibitors [65]. We have also discussed and tabulated the differences between MBC and FBC in Table 1.

5. Limitations

This study highlights the generalizability of its findings, particularly in addressing the need for chemotherapy and psychosocial programs for MBC, and the significance of life prolongation based on prognostic factors in MBC treatment. Survival following metastasis has been shown to have a marked impact on men's QOL [32, 33], and fear related to body image, complications, or risk of side effects from local recurrence has been studied [22, 23, 35–37]. However, specific factors influencing men's QOL in MBC remain underexplored.

One of the most significant challenges in treating and managing MBC is the widespread lack of awareness and understanding of the disease [66]. This lack of knowledge can lead to delays in diagnosis, misdiagnosis and inadequate treatment, all of which negatively impact patient outcomes. Unlike breast cancer in women, MBC is often overlooked by both the public and the medical community, contributing to stigma and a reluctance among men to seek timely medical advice [67]. To address this issue, it is crucial to implement targeted awareness campaigns that educate both healthcare providers and the public about the risk factors, symptoms, and importance of early detection of MBC. Healthcare professionals, in particular, should be trained to recognize the signs of breast cancer in men and to understand the unique psychosocial challenges these patients face.

Increasing awareness is not just about improving diagnosis rates, it also plays a vital role in ensuring that men receive comprehensive support throughout their treatment journey [68]. This includes access to tailored psychosocial programs that address issues like body image, sexual health, and the psychological impact of a cancer diagnosis, all of which are often underrepresented in discussions about MBC. Focusing on awareness is essential for reducing disparities in care and improving outcomes for men with breast cancer.

These limitations include the following. Several studies have shown that breast cancer treatment, recovery and follow-up in men can lead to a decrease in the QOL, as measured by outcomes. Decreased sexual function and libido in men can lead to a lower QOL and genetically inferior survival compared to that in women [20, 21, 39–44]. In the future, new male-specific breast cancer therapies will be required through the development of new targeted therapies based on gene mutations and targeted therapies [69].

6. Conclusions

MBC treatment impacts both quality of life (QOL) and psychosocial domains in men. Clinical and randomized controlled trials are essential for advancing the treatment of breast cancer in men and for developing effective chemotherapy and aftercare methods. Identifying factors that affect men's QOL, understanding the facilitators and barriers to achieving a positive QOL, and providing robust support for men's treatment decisions are all crucial for improving outcomes.

TABLE 1. Summary of differences between MBC and FBC.

Division	MBC	FBC
Incidence rate	Less than about 1% of all breast cancers	Most (about 99%) of breast cancer patients
Key risk factors	BRCA2 mutation, Klinefelter syndrome, low testosterone, family history	BRCA1/BRCA2 mutations, hormonal changes, and family history
Clinical of the disease	Most diagnosed in older age Delayed initial diagnosis	Can occur across a wide range of ages more frequently diagnosed at an earlier stage
When to diagnose	Diagnosis is likely to be delayed Symptoms are mild	Regular checkups and self-exams for early diagnosis
Tumor characteristics	Mostly ER^+	$ER^+/PR^+/HER2^+$ and other subtypes
Treatment strategies	Mainly mastectomy (MRM), antihormonal therapy (tamoxifen, AI)	BCS and breast reconstruction, anti-hormonal therapy, and chemotherapy
Prognosis	Poorer prognosis than women Higher mortality rate	Early diagnosis and effective treatment increase survival rates
Recurrences and complications	High risk of recurrence, lymphedema, sexual dysfunction, psychological stress	Risk of recurrence, psychological well-being after breast reconstruction

MBC, male breast cancer; FBC, female breast cancer; BRCA, breast cancer gene 1/2; ER^+, estrogen receptor-positive; PR^+, progesterone receptor positive; $HER2^+$, human epidermal growth factor receptor 2 positive; MRM, modified radical mastectomy; AI, aromatase inhibitor; BCS, breast-conserving surgery.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

YP and YSJ—conceptualization; validation; writing-review. YP—methodology, software; formal analysis, investigation, resources, data curation, writing-original draft preparation; editing, visualization. YSJ—supervision. Both authors have read and agreed to the published version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jomh.org/files/article/1928269165222608896/attachment/Supplementary%20material.docx.

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