Supplementary material

Supplementary Table 1. Summary of scoping review articles.

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| Reference | Aims/Objectives | Design/Methodology | Data Collection/Sample | Sample Characteristics | Key Findings |
| Katano *et al.* [22] | Identify a rare case of male breast cancer with spontaneous regression; emphasize the need for ongoing surveillance | Qualitative, case report | A patient with MBC, hypertension, and type 2 diabetes | 70-year-old male | Tumors in breast cancer may temporarily regress and reappear. Continuous monitoring is essential even if the tumor appears to vanish. |
| Cho *et al.* [23] | Investigate the association between lymphopenia after breast-conserving therapy and ipsilateral breast tumor recurrence in early breast cancer (EBC) | Qualitative, case report | Patients with early breast cancer | 216 patients who received breast-conserving therapy from 2012–2016 | Psychological stress interventions reduce ipsilateral breast tumor recurrence. EBC can occur at any age and requires active psychosocial support. |
| Yu *et al.* [24] | Compare the prognosis of MBC with postmenopausal FBC and follow-up | Quantitative, prospective | Patients who completed MBC treatment with follow-up data from 2001 to 2011 | 91 MBC cases and 364 FBC cases | MBC prognosis is worse compared to FBC. Endocrine therapy improves MBC prognosis. |
| Zhao *et al.* [25] | Evaluate the effectiveness of a 12-week exercise-based weight management program in overweight/obese breast cancer survivors | Quantitative, prospective, randomized controlled trial, single-blinded | Overweight/obese breast cancer survivors | 60 survivors with stage 0–III breast cancer | Exercise and weight management are effective in MBC survivorship care. |
| Ottini *et al*. [26] | To provide a comprehensive review of MBC, including its epidemiology, risk factors, molecular characteristics, and clinical management | A critical review of existing literature on MBC, analyzing epidemiological, genetic, and clinical studies | Secondary data collected from published studies, focusing on MBC cases and associated clinical and genetic factors | The reviewed studies include MBC patients, with a focus on genetic predispositions, hormonal profiles, and clinical presentations | MBC is rare (<1% of breast cancers), often diagnosed at advanced stages. Key risk factors include BRCA2 mutations, hormonal imbalances, and family history. Hormone receptor positivity makes endocrine therapy essential. More research is needed for tailored treatments. |
| Koleilat *et al*. [27] | To report a rare case of metastatic MBC presenting as an obstructing colon mass, highlighting diagnostic challenges | Case report | Single case of a male patient with metastatic ductal breast cancer mimicking colon cancer | Male patient with a history of breast cancer presenting with symptoms of bowel obstruction | Metastatic MBC can mimic primary colon cancer, posing diagnostic challenges. Accurate diagnosis requires awareness of atypical presentations and thorough clinical evaluation |
| Ko *et al*. [28] | To describe the surgical management and outcomes of a MBC case with metastasis to the thoracic spine | Case report | Single case of a male patient with thoracic spine metastasis from MBC | Male patient with metastatic breast cancer presenting with thoracic spine involvement, leading to neurological symptoms. | Surgical intervention effectively relieved spinal cord compression and improved neurological function. Early detection and tailored surgical treatment can enhance outcomes in metastatic MBC cases. |
| Mada *et al*. [29] | To report a rare case of male invasive ductal carcinoma with new metastases after incomplete adjuvant therapy | Case report | Single case of a male patient with invasive ductal carcinoma and subsequent metastasis | Male patient who experienced disease remission followed by new metastases after not completing adjuvant therapy | Incomplete adjuvant therapy can lead to disease progression and new metastases. This highlights the importance of adhering to complete treatment regimens to improve outcomes in male breast cancer |
| Jones [30] | To review the challenges in treating metastatic breast cancer and discuss advancements in therapeutic options | Review article summarizing current treatment approaches and challenges for MBC | Analysis of existing studies and clinical trials on MBC treatments | Includes data from diverse populations of MBC patients across multiple studies | MBC is hard to treat due to heterogeneity and resistance. Targeted and personalized therapies improve outcomes |
| Dragoumis *et al*. [31] | To report a rare case of pure mucinous carcinoma in a male breast with axillary lymph node metastasis | Case report | Single case of a male patient diagnosed with pure mucinous carcinoma and lymph node metastasis | Male patient with a rare subtype of breast cancer and regional lymph node involvement | Pure mucinous carcinoma in men is rare but can metastasize to lymph nodes. Early diagnosis and tailored treatment are critical for better outcomes |
| Brufsky *et al.* [32] | Compare baseline characteristics of patients with and without CNS metastases; evaluate incidence, time to development, treatment, and survival after CNS metastases; assess treatment impact on survival | Qualitative, prospective, observational study | 1023 HER2-positive metastatic breast cancer (MBC) patients | Patients with CNS metastases | 377 of 1012 HER2-positive MBC patients (37.3%) developed CNS metastases. Trastuzumab and chemotherapy were effective; surgery and radiation had limited impact. |
| de Almeida Freire *et al.* [33] | Report a case of oral and maxillofacial metastatic tumors | Qualitative, case report | A man with oral and maxillofacial metastatic tumors | 88-year-old male | MBC often metastasizes to the prostate, lungs and kidneys. Red oral crystalline breast cancer is significant in men with a history of malignancy. |
| Visram *et al.* [35] | Determine the toxicity of endocrine therapies for MBC | Quantitative, prospective | Male patients diagnosed with breast cancer from 1981–2003 | 59 MBC patients (average age 68) | Tamoxifen toxicity occurred in 50% of patients, causing decreased libido, weight gain, malaise, leg edema and depression. |
| Pemmaraju *et al.* [36] | Evaluate antihormonal therapy toxicity in MBC patients | Quantitative, prospective | Male patients diagnosed with breast cancer from 1999–2009 | 64 MBC patients (average age 61) | Tamoxifen toxicity led to weight gain, sexual dysfunction, eye disorders, leg cramps, neurocognitive problems and bone pain. It may cause thromboembolic events. Discontinuation should be considered. |
| Masci *et al.* [37] | Report clinicopathological characteristics and treatment patterns; outcomes of MBCs treated over a 10-year period | Qualitative, case report | Patients with MBC treated from 2000 to 2013 | 97 MBC patients (mean age 65 years; range 25–87 years) | MBC and female breast cancer (FBC) exhibit different biological patterns. HER2-positive treatments are effective for MBC. Endocrine therapies and trastuzumab, common for FBC, are safe and effective in men. |
| Chichura *et al.* [43] | Investigate MBC patient experiences and opinions on reconstructive or breast-conserving surgery after mastectomy | Quantitative, prospective | Patients with MBC and members of the American Society of Breast Surgeons | 63 MBC patients (mean age 65 years; range 31–79 years) | Negative body image is a major factor in depression among MBC patients. Body concealment through clothing is common, and patients have a negative perception of their appearance after surgery. |
| Edman Kessler *et al.* [44] | Compare surgical outcomes between breast-conserving surgery (BCS) and modified radical mastectomy (MRM) | Quantitative, prospective | Patients who underwent breast surgery for MBC in 2015 | 101 of 175 MBC patients (average age 60 years) | BCS spares the nipple and a significant portion of the breast, reducing the risk of necrosis and preserving nipple and breast circulation. |
| Wang *et al.* [45] | Compare mortality rates between male and female breast cancer patients | Quantitative, prospective | Patients diagnosed with breast cancer between 01 January 2004, and 31 December 2014 | 16,025 males (average age 63.3 years); 180,708 females (average age 59.9 years) | Men have more comorbid conditions compared to women. MBC patients have a higher mortality rate than FBC patients. MBC follows FBC guidelines due to the lack of specialized clinical trials. |
| Eggemann *et al.* [46] | Determine the effect of adjuvant treatment with tamoxifen plus an aromatase inhibitor (AI) on survival in men with breast cancer | Qualitative, case report, clinical trial | 257 male patients with hormone-receptor-positive breast cancer | Median age at diagnosis 68 (range 36–91 years) | AI treatment increases the risk of death by 1.5 times compared to tamoxifen. MBC patients receiving adjuvant tamoxifen treatment have better outcomes than those receiving AIs. |
| Towfighi *et al.* [47] | Assess the incidence and trends of breast reconstruction in men | Quantitative, prospective | Males with breast cancer who underwent partial or total mastectomy | 1167 men who underwent breast surgery; 73 (6.3%) had reconstructive surgery within 30 days | MBC patients face psychosocial issues due to post-operative body dysmorphia. Most breast reconstruction patients are Caucasian (74%). Implant-based reconstruction is the most common type. |
| Reinisch *et al.* [48] | Evaluate changes in estradiol levels in patients with MBC after 3 months of treatment | Qualitative, case report, clinical trial | Patients recruited from 24 breast units across Germany from October 2012 to May 2017 | 56 male patients with hormone receptor-positive breast cancer | Sexual function in men is associated with quality of life (QOL). The addition of GnRH agonists decreased sexual function and QOL. Tamoxifen alone or with GnRH agonists decreased estradiol levels. |

CNS: central nervous system; EBC: early breast cancer; FBC: female breast cancer; MBC: male breast cancer; BCS: breast-conserving surgery; MRM: modified radical mastectomy; AI: aromatase inhibitor; GnRH: gonadotropin-releasing hormone; HER2: human epidermal growth factor receptor 2.