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ORIGINAL ARTICLE

Quality of life and symptom burden in patients with metastatic breast cancer

Christine Ecclestone[1] · Ronald Chow[1] · Natalie Pulenzas[1] · Liying Zhang[1] · Angela Leahey[1] · Julia Hamer[1] · Carlo DeAngelis[1] · Gillian Bedard[1] · Rachel McDonald[1] · Anchal Bhatia[1] · Janet Ellis[1] · Eileen Rakovitch[1] · Sherlyn Vuong[1] · Edward Chow[1] · Sunil Verma[1]

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Abstract
Purpose The goal of this study was to examine the symptom burden (SB) and quality of life (QOL) in patients with metastatic breast cancer.
Methods Breast cancer patients with metastases were asked to complete the Edmonton Symptom Assessment System (ESAS) and FACT-B questionnaires. Statistical analysis was performed to identify (1) any differences in SB and QOL between patients with bone metastases only and patients with visceral +/− bone metastases and (2) any associations between SB and/or QOL and various clinical factors, including treatment with bisphosphonates, participation in a clinical trial and presence of brain metastases.
Results A total of 174 patients were enrolled. Treatment with bisphosphonates was significantly associated with lower ESAS well-being scores (less symptoms) in patients with bone metastases only. In this same group, receiving treatment prior to diagnosis of metastases was significantly associated with increased fatigue, anxiety and dyspnoea. The presence of brain metastases was associated with higher physical well-being scores (increased QOL). Participation in clinical trials was associated with better QOL.
Conclusion Breast cancer patients with metastases have different SB and QOL in relation to the type of the metastases, treatment interventions and participation in clinical trials.

✉ Edward Chow
Edward.Chow@sunnybrook.ca

[1] Odette Cancer Centre, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, ON, Canada

Keywords Quality of life · Symptom burden · Metastatic breast cancer

Introduction

Breast cancer is the most common cancer in women, with one in nine women expected to develop the disease during their lifetime [1]. While breast cancer mortality rates have decreased substantially in recent years, an estimated 20–30 % of breast cancer patients will relapse with metastases in distant organs [2]. The 5-year survival rate for metastatic breast cancer patients is 22 %, substantially lower than those for patients with stages 0–III breast cancer [4]. Approximately 6–10 % of breast cancer cases are metastatic at the time of diagnosis; these are referred to as "de novo" cases. De novo patients who initially present with stage IV disease have a median survival time of 39 months, while those who relapse from a previous breast cancer and developed distant metastases have a median survival time of 27 months [3].

Common sites of metastases from breast cancer primaries include bone, liver, lung and brain. It is possible for breast cancer to metastasize to the bones only, with no visceral organs being affected. Patients with only bone metastases represent 3 % of total breast cancer cases and 15 % of metastatic breast cancer cases [5, 6]. They have a more favourable prognosis with a median survival of 24–54 months and overall survival of 10 years at 35 % [7].

Though advances in screening and treatment have led to substantial increases in breast cancer survival rates in recent years, prognoses for stage IV metastatic breast cancer patients remain poor. Treatment for metastatic breast cancer patients is not curative, but rather palliative in intent, with the goal of improving quality of life (QOL). There are issues with QOL in metastatic breast cancer population. Patients with bone

metastases are more likely to report significant pain [8]. Patients with visceral metastases often receive multiple lines of treatment and are hence exposed to increased side effects that can impact their QOL [9].

The goal of this study was twofold: (1) identify any differences in symptom burden (SB) and QOL between patients with bone metastases only and patients with visceral +/− bone metastases and (2) identify any associations between SB and/or QOL and various clinical factors, including treatment with bisphosphonates, participation in a clinical trial and presence of brain metastases.

Methods

Patients with metastatic breast cancer attending the Odette Cancer Centre were asked to participate in the study. On average, 30 patients with metastatic breast cancer are seen at the Odette Cancer Centre each month. Certain patients were not approached for various reasons including if the nurse or clinic coordinator perceived that the patient was too emotionally distressed, if the patient was feeling quite ill on the day of their appointment, if the patient's disease was progressing rapidly or they were not tolerating treatment well. Patients who did not speak English were excluded from the study. Those who expressed interest in participating were approached by a research assistant. After written consent was provided, the patients were then asked to complete the Edmonton Symptom Assessment System (ESAS) and Functional Assessment of Cancer Therapy—Breast cancer module (FACT-B) while they were in a clinic room waiting to see their oncologists. Patients completed the questionnaires on their own unless they requested that a research assistant assist them. Demographic data including treatment type, diagnosis date, stage of cancer, site of metastasis and tumour characteristics was collected from hospital records. Further information regarding metastases was also collected, such as date of diagnosis of metastases, treatment for metastases, participation in a clinical trial and use of bisphosphonates.

The ESAS is a reliable and valid questionnaire used to assess SB in cancer patients [10]. The ESAS has been found to have good test-retest reliability, internal consistency and favourable convergent and divergent validity for physical symptoms [10]. The ESAS assesses nine symptoms: fatigue, drowsiness, nausea, appetite loss, pain, depression, anxiety, overall sense of well-being and dyspnea. Patients rate each of their symptoms on an 11-point scale, ranging from 0 (absence) to 10 (worst). For overall sense of well-being, a score of 0 on the ESAS represents best well-being while a score of 10 represents worst well-being. High scores on the ESAS indicate high SB. QOL is similarly assessed in breast cancer patients using the FACT-B, with five domains of QOL: physical, functional, emotional, social and additional concerns specific to breast cancer patients. Patients respond to statements on a five-point scale, 0 (not at all) to 4 (very much). Low scores in the physical well-being section, the emotional well-being section (except item 2) and the additional concerns section (except items B4 and B9) indicate high QOL. High scores in the social well-being section, functional well-being section and items GE2, B4 and B9 indicate high QOL. The FACT-B has been found to have good internal consistency, test-retest reliability and high divergent, convergent and known group validity [11].

Statistical analysis

To search for differences in SB and QOL (outcome) between patients with bone metastases only and patients with visceral +/− bone metastases (binary independent variable), general linear regression analysis was primarily conducted. Furthermore, patients were separated into one of two groups for the purpose of statistical analyses: (1) patients with bone metastases only and (2) patients with visceral +/− bone metastases. Within each group, the following binary factors (yes or no) were considered as the independent variables: treatment with bisphosphonates, received treatment prior to diagnosis of metastases, participation in a clinical trial and presence of brain metastases. To identify the presence of a significant association between each outcome (i.e. QOL and SB) and the above independent variables, univariate linear regression analysis was also conducted. Natural log transformation was applied for all ESAS scales to normalize distribution. We estimated the coefficient (the slope of the fitted regression line), standard error of coefficient, coefficient of determination (R^2; the higher the R^2 value, the better the model fit) and p value (describes the difference between the groups). p Values <0.05 were considered statistically significant. All analyses were performed using Statistical Analysis Software (SAS version 9.4 for Windows).

Results

From January to August 2014, a total of 174 patients were enrolled, representing 70 % of metastatic breast cancer patients attending the Odette Cancer Centre. Their ages ranged from 32 to 93 years. There were 43 patients with bone metastases only and 131 patients with visceral +/− bone metastases. Patient demographics are detailed in Table 1. The median ESAS and the FACT-B scores of the two groups are listed in Table 2.

We first compared the differences in SB and QOL between patients with bone metastases only and patients with visceral +/− bone metastases using general linear regression analysis. No significant differences in ESAS symptoms or FACT-B QOL were observed between patients with bone metastases

Table 1 Demographics of the enrolled patients

	Bone metastases (n = 43)	Visceral +/− bone metastases (n = 131)
Demographics		
Age (years)		
n	43	131
Median (range)	62 (36–93)	59 (32–92)
KPS		
n	42	129
Median (range)	100 (60–100)	100 (30–100)
Stage		
DCIS	0 (0.00 %)	0 (0.00 %)
Early	0 (0.00 %)	1 (0.76 %)
Locally advanced	0 (0.00 %)	0 (0.00 %)
Metastatic	43 (100.00 %)	130 (99.24 %)
ER		
Negative	2 (4.65 %)	28 (22.22 %)
Positive	41 (95.35 %)	98 (77.78 %)
PR		
Negative	5 (11.63 %)	40 (32.00 %)
Positive	38 (88.37 %)	85 (68.00 %)
HER2		
Negative	32 (86.49 %)	84 (75.68 %)
Positive	5 (13.51 %)	27 (24.32 %)
Regional lymph nodes		
No	10 (27.03 %)	30 (27.03 %)
Yes	27 (72.97 %)	81 (72.97 %)
Clinical factors		
Post-diagnosis of primary cancer		
0–1 year	5 (11.90 %)	5 (3.91 %)
> 1 to 4 years	13 (30.95 %)	41 (32.03 %)
> 4 years	24 (57.14 %)	82 (64.06 %)
Post-diagnosis of metastases		
0–1 year	14 (35.90 %)	35 (27.13 %)
> 1 to 4 years	16 (41.03 %)	60 (46.51 %)
> 4 years	9 (23.08 %)	34 (26.36 %)
Local recurrence within past 6 months		
Recurrence within past 6 months	0 (0.00 %)	0 (0.00 %)
Recurrence more than 6 months	1 (16.67 %)	0 (0.00 %)
Never had a recurrence	5 (83.33 %)	9 (100.00 %)
Local recurrence within the past year		
Recurrence within the past year	0 (0.00 %)	0 (0.00 %)
Recurrence longer than a year	1 (16.67 %)	0 (0.00 %)
Never had a recurrence	5 (83.33 %)	9 (100.00 %)
Other metastases		
No	5 (11.63 %)	9 (6.87 %)
Recurrence	1 (2.33 %)	0 (0.00 %)
Yes	37 (86.05 %)	122 (93.13 %)
Radiation		
No	5 (11.63 %)	18 (13.74 %)
Yes	38 (88.37 %)	113 (86.26 %)
Chemotherapy		
No	14 (33.33 %)	16 (12.21 %)
Yes	28 (66.67 %)	115 (87.79 %)
Hormotherapy		
No	4 (9.30 %)	32 (24.43 %)
Yes	39 (90.70 %)	99 (75.57 %)

only and patients with visceral +/− bone metastases. As no significant differences were found, we conducted the remainder of the analysis both separately within each group (patients with bone metastases only and patients with visceral +/− bone metastases) as well as combined (patients with bone metastases only and patients with visceral +/− bone metastases together in one group).

Association between bisphosphonate use and QOL or SB was analysed. Lower ESAS well-being scores (better well-being) were significantly associated with bisphosphonate treatment (p = 0.025) in patients with bone metastases only. There were no other significant associations in other ESAS symptoms or in any domains of the FACT-B in patients with and without bisphosphonate treatment (Table 3). When both

Table 2 ESAS and FACT scores of patients with bone metastases only vs. those with visceral+/− bone metastases (median and range)

		Median	Min	Max
ESAS scores (0–10)				
Pain	Bone metastases	2.0	0.0	7.0
	Visceral +/− bone metastases	1.0	0.0	10.0
Tired	Bone metastases	3.0	0.0	9.0
	Visceral +/− bone metastases	3.0	0.0	10.0
Nausea	Bone metastases	0.0	0.0	3.0
	Visceral +/− bone metastases	0.0	0.0	9.0
Depression	Bone metastases	0.5	0.0	10.0
	Visceral +/− bone metastases	1.0	0.0	9.0
Anxious	Bone metastases	1.0	0.0	8.0
	Visceral +/− bone metastases	2.0	0.0	10.0
Drowsy	Bone metastases	0.0	0.0	8.0
	Visceral +/− bone metastases	1.0	0.0	10.0
Appetite loss	Bone metastases	0.0	0.0	8.0
	Visceral +/− bone metastases	1.0	0.0	10.0
Well-being	Bone metastases	2.0	0.0	7.0
	Visceral +/− bone metastases	3.0	0.0	10.0
Dyspnoea	Bone metastases	0.0	0.0	9.0
	Visceral +/− bone metastases	0.0	0.0	10.0
FACT-B scores				
FACT: Physical well-being (0–28)	Bone metastases	22.2	5.0	28.0
	Visceral +/− bone metastases	22.0	1.0	28.0
FACT: Social well-being (0–28)	Bone metastases	24.5	7.0	28.0
	Visceral +/− bone metastases	24.0	5.0	28.0
FACT: Emotional well-being (0–24)	Bone metastases	17.0	2.0	24.0
	Visceral +/− bone metastases	17.0	3.0	24.0
FACT: Functional well-being (0–28)	Bone metastases	18.0	0.0	28.0
	Visceral +/− bone metastases	18.5	0.0	28.0
FACT: Breast cancer subscale (0–40)	Bone metastases	27.0	7.8	36.7
	Visceral +/− bone metastases	25.6	6.0	40.0
FACT-G total score (0–108)	Bone metastases	81.0	37.0	104.0
	Visceral +/− bone metastases	81.8	20.8	108.0
FACT-B Trial Outcome Index (TOI 0–96)	Bone metastases	67.0	38.2	92.0
	Visceral +/− bone metastases	66.0	15.0	93.0
FACT-B total score (0–148)	Bone metastases	105.9	61.4	140.0
	Visceral +/− bone metastases	106.8	38.8	143.6

metastatic groups were analysed together (patients with bone metastases only and patients with visceral +/− bone metastases), bisphosphonate treatment was significantly associated with lower appetite loss scores (better appetite; $p = 0.047$). No other significant associations between QOL and/or SB and bisphosphonate treatment were found (Table 4).

The association of participation in a clinical trial with QOL and SB was also assessed. Among 43 patients with bone metastases only, 3 patients participated in a clinical trial. As such, there were not enough patients with bone metastases only to assess the significant associations between participation in a clinical trial and QOL and/or SB in this group. Thus, analysis was only conducted in the visceral +/− bone metastases group ($n = 16$ and $n = 114$ for patients with and without participation in a clinical trial, respectively). Lower ESAS fatigue scores were significantly associated with participating in a clinical trial in patients with visceral +/− bone metastases ($p = 0.024$). There were no other significant associations found between SB and/or QOL and participation in a clinical trial.

Association of QOL and/or SB with brain metastases was analysed in patients with visceral +/− bone metastases ($n = 18$ and $n = 112$ for patients with and without brain metastases, respectively). Lower ESAS scores of fatigue ($p = 0.017$) and

Table 3 Association between QOL and SB and bisphosphonate treatment in breast cancer patients with bone metastases only

Outcome of each QOL	Coefficient	SE	*p* value*	R^2
Only in metastatic patients with bone metastases				
ESAS: Pain	−0.296	0.218	0.1809	0.044
ESAS: Tired	−0.268	0.238	0.2663	0.031
ESAS: Nausea	−0.124	0.116	0.2895	0.028
ESAS: Depression	−0.368	0.241	0.1346	0.055
ESAS: Anxious	−0.092	0.258	0.7246	0.003
ESAS: Drowsy	−0.246	0.241	0.3137	0.026
ESAS: Appetite loss	−0.410	0.242	0.0979	0.067
ESAS: well-being	*−0.547*	*0.234*	*0.0247*	*0.120*
ESAS: Dyspnoea	−0.374	0.253	0.1473	0.052
FACT: Physical well-being	2.100	1.919	0.2803	0.029
FACT: Social well-being	2.485	1.707	0.1532	0.050
FACT: Emotional well-being	1.957	1.923	0.3150	0.025
FACT: Functional well-being	2.589	2.289	0.2646	0.031
FACT: Breast cancer subscale	0.330	2.060	0.8734	0.001
FACT-G total score	9.346	5.597	0.1029	0.067
FACT-B Trial Outcome Index (TOI)	5.807	4.617	0.2162	0.040
FACT-B total score	10.756	6.840	0.1241	0.061

*p Value <0.05 was considered as statistically significant

Data in italics were statistically significant

dyspnoea (p = 0.021) were significantly associated with the presence of brain metastases. Additionally, presence of brain metastases was significantly associated with higher physical well-being scores (p = 0.034) (Table 5).

Table 4 Association between QOL and SB and bisphosphonate treatment in all metastatic breast cancer patients

Outcome of each QOL	Coefficient	SE	*p* value*	R^2
In metastatic patients with bone metastatic or visceral +/− bone metastatic group				
ESAS: Pain	0.132	0.113	0.2435	0.008
ESAS: Tired	−0.023	0.110	0.8373	0.000
ESAS: Nausea	0.053	0.079	0.5048	0.003
ESAS: Depression	−0.144	0.120	0.2289	0.009
ESAS: Anxious	−0.217	0.121	0.0739	0.019
ESAS: Drowsy	−0.036	0.120	0.7638	0.001
ESAS: Appetite loss	*−0.241*	*0.120*	*0.0470*	*0.023*
ESAS: Well-being	−0.100	0.113	0.3783	0.005
ESAS: Dyspnoea	−0.044	0.123	0.7226	0.001
FACT: Physical well-being	−0.385	0.971	0.6927	0.001
FACT: Social well-being	1.161	0.772	0.1346	0.013
FACT: Emotional well-being	1.073	0.793	0.1777	0.011
FACT: Functional well-being	0.660	1.050	0.5307	0.002
FACT: Breast cancer subscale	0.890	0.977	0.3636	0.005
FACT-G total score	2.329	2.742	0.3969	0.004
FACT-B Trial Outcome Index (TOI)	1.207	2.543	0.6357	0.001
FACT-B total score	3.436	3.416	0.3161	0.006

*p Value <0.05 was considered as statistical significance

Data in italics were statistically significant

Table 5 Association between QOL and SB and presence of brain metastases in metastatic breast cancer patients

Outcome of each QOL	Coefficient	SE	*p* value*	R^2
Only in metastatic patients with visceral +/− bone metastases				
ESAS: Pain	−0.277	0.190	0.1476	0.016
ESAS: Tired	*−0.427*	*0.177*	*0.0173*	*0.044*
ESAS: Nausea	−0.163	0.141	0.2494	0.010
ESAS: Depression	−0.382	0.199	0.0573	0.028
ESAS: Anxious	−0.152	0.201	0.4509	0.005
ESAS: Drowsy	−0.220	0.201	0.2753	0.009
ESAS: Appetite loss	−0.180	0.203	0.3771	0.006
ESAS: Well-being	−0.054	0.184	0.7718	0.001
ESAS: Dyspnoea	*−0.471*	*0.201*	*0.0207*	*0.041*
FACT: Physical well-being	*3.483*	*1.625*	*0.0339*	*0.035*
FACT: Social well-being	0.993	1.271	0.4361	0.005
FACT: Emotional well-being	1.303	1.255	0.3012	0.009
FACT: Functional well-being	2.365	1.723	0.1724	0.015
FACT: Breast cancer subscale	1.816	1.630	0.2673	0.010
FACT-G total score	7.951	4.528	0.0816	0.024
FACT-B Trial Outcome Index (TOI)	7.629	4.320	0.0798	0.024
FACT-B total score	9.854	5.666	0.0845	0.024

*p Value <0.05 was considered as statistically significant

Data in italics were statistically significant

SB and QOL were also evaluated in metastatic breast cancer patients (both bone metastases only patients and visceral +/− bone metastases patients) who had and had not received treatment prior to diagnoses of metastases. There were 26 patients with previous diagnosis and 13 patients without previous diagnosis in bone metastases only patients; there were 90 patients with previous diagnosis and 38 patients without previous diagnosis in visceral +/− bone metastases patients. Results indicated that greater burden of fatigue (p = 0.041), anxiety (p = 0.049) and dyspnoea (p = 0.016) was significantly associated with receiving treatment prior to diagnosis of metastases in patients with bone metastases only, based on their ESAS scores. No significant associations between treatment prior to diagnosis and any domain of QOL were observed in this patient group. In the visceral +/− bone metastases group, treatment prior to diagnosis of metastases had no significant association with QOL or SB (Table 6).

Analysis was conducted to identify if any significant association exists between QOL and/or SB and diagnosis of metastases at initial diagnosis of breast cancer. It was found that time of diagnosis of metastases (diagnosis of metastases at the same time or after initial diagnosis) had no significant association with QOL or SB in either groups (patients with bone metastases only and patients with visceral +/− bone metastases).

Discussion

QOL has become an important measure of treatment success for breast cancer patients as survival rates are increasing. Patients at different stages of breast cancer are exposed to different treatments with various side effects that are associated with increased SB and decreased QOL. Metastatic breast cancer patients also often receive multiple lines of treatment and face the emotional effect of a negative prognosis.

A cross-sectional study published in 2012 by Reed et al. reported that patients with metastatic breast cancer to bone only experienced worse pain compared to those with visceral metastases [8]. However, our current study found no differences in QOL or SB between these two patient populations. The lack of observed differences could reflect improved pain management strategies for patients with bone metastases that have become commonplace since 2012.

Bisphosphonate treatment for patients with bone metastases has been shown to reduce declines in QOL and/or improve QOL by reducing the frequency of skeletal events [12–14]. The results of our study support the findings that patients with bone metastases only who are treated with bisphosphonates report better well-being. However, since no other associations were found using the ESAS and FACT-B, the association between bisphosphonate treatment and QOL cannot be

Table 6 Association between QOL and SB and treatment prior to diagnosis of metastases in metastatic breast cancer patients

Outcome of each QOL	Coefficient	SE	*p* value*	R^2
In metastatic patients with bone metastatic group				
ESAS: Pain	0.310	0.238	0.2014	0.045
ESAS: Tired	*0.540*	*0.255*	*0.0410*	*0.111*
ESAS: Nausea	0.218	0.124	0.0875	0.079
ESAS: Depression	−0.048	0.263	0.8559	0.001
ESAS: Anxious	*0.524*	*0.258*	*0.0499*	*0.103*
ESAS: Drowsy	0.266	0.258	0.3093	0.030
ESAS: Appetite loss	0.177	0.277	0.5256	0.011
ESAS: Well-being	0.366	0.255	0.1594	0.054
ESAS: Dyspnoea	*0.639*	*0.253*	*0.0162*	*0.150*
FACT: Physical well-being	−3.194	2.030	0.1245	0.064
FACT: Social well-being	−0.333	1.972	0.8668	0.001
FACT: Emotional well-being	1.785	1.909	0.3560	0.023
FACT: Functional well-being	2.769	2.409	0.2577	0.034
FACT: Breast cancer subscale	1.630	2.205	0.4646	0.015
FACT-G total score	0.006	6.032	0.9992	0.000
FACT-B Trial Outcome Index (TOI)	−1.403	5.093	0.7846	0.002
FACT-B Total Score	−0.625	7.508	0.9341	0.000
In metastatic patients with visceral +/− bone metastatic group				
ESAS: Pain	−0.210	0.146	0.1523	0.016
ESAS: Tired	−0.106	0.137	0.4403	0.005
ESAS: Nausea	−0.042	0.109	0.6994	0.001
ESAS: Depression	0.139	0.154	0.3683	0.006
ESAS: Anxious	0.066	0.155	0.6726	0.001
ESAS: Drowsy	0.067	0.154	0.6653	0.002
ESAS: Appetite loss	0.079	0.156	0.6139	0.002
ESAS: Well-being	0.225	0.140	0.1108	0.020
ESAS: Dyspnoea	−0.155	0.157	0.3246	0.008
FACT: Physical well-being	0.437	1.264	0.7301	0.001
FACT: Social well-being	0.703	0.973	0.4713	0.004
FACT: Emotional well-being	−0.974	0.971	0.3182	0.008
FACT: Functional well-being	0.073	1.343	0.9568	0.000
FACT: Breast cancer subscale	0.104	1.258	0.9344	0.000
FACT-G total score	0.371	3.552	0.9170	0.000
FACT-B Trial Outcome Index (TOI)	0.957	3.390	0.7781	0.001
FACT-B total score	0.584	4.449	0.8957	0.000

*p Value <0.05 was considered as statistically significant

Data in italics were statistically significant

attributed to the improvement of a specific symptom or domain of QOL. When all metastatic breast cancer patients were analysed together, bisphosphonate treatment was associated with lower appetite loss scores. Therefore, a relationship between bisphosphonate treatment and reduction in SB was identified; however, a lack of clarity remains in terms of how such reductions in SB are related to bisphosphonate use.

Quite commonly, patients with metastatic cancer participate in clinical trials. Participation brings with it the potential for increased burden of more frequent hospital visits as per trial protocols, as well as potential exposure to increased side effects with experimental drugs. However, we found that participation in clinical trials was associated with less fatigue in patients with visceral +/− bone metastases. It is possible that

patients who are not experiencing significant SB would be more likely to commit to taking part in a clinical trial. The lower fatigue scores reported by patients participating in a clinical trial could be attributed to the Hawthorne effect which describes the possibility of research participants' behaviour being impacted or modified simply by the awareness of being studied [15]. However, it is unclear why only fatigue scores differed with clinical trial participation as the Hawthorne effect could influence other aspects SB as well. Further research should aim to identify the specific correlation between QOL, SB and clinical trial participation in breast cancer patients by exploring the positive and negative aspects of trial participation as described by patients.

The unique correlation of brain metastases with SB and QOL is not well documented in the literature. It is assumed that chemotherapy is of limited benefit to target brain lesions, and treatment for brain metastases often includes stereotactic radiosurgery or whole brain radiotherapy [16]. In our study, the presence of brain metastases was associated with lower SB (less fatigue and dyspnea) and improved physical well-being. Further research should be conducted to pin-point the cause of the observed increased QOL in breast cancer patients with brain metastases.

We observed that receiving breast cancer treatment prior to the diagnosis of stage IV disease was associated with increased fatigue, anxiety and dyspnea scores in patients with bone metastases only. This relationship has not previously been reported and therefore deserves further exploration in future investigations. Interestingly, no correlation between QOL or SB with previous treatment was reported for breast cancer patients with visceral +/− bone metastases. We also found that there was no association between time of diagnosis of metastases and QOL and SB. Further investigation is needed to explore this result.

The limitation of this study was the small sample size. While there were a total of 174 patients with stage IV breast cancer, specific analyses resulted in the number of participants in each group to be relatively small. Additionally, as few inclusion/exclusion criteria were implemented, there were immense variations in demographics, treatment and location of metastases making the source of differences in QOL and SB, or lack thereof, impossible to attribute to one sole source. If the nurse or clinic coordinator perceived that the patient was too emotionally distressed or if the patient was feeling quite ill on the day of their appointment, they were not approached regarding study participation. For this reason, it is possible that patients with very high SB or low QOL could have been excluded. This must be taken into account when considering the generalizability of the results. Finally, patients with stage IV disease that were progressing rapidly or who were not tolerating treatment well were not approached for participation in this study if deemed inappropriate by their oncologist. For this reason, no data was collected for patients at end of life, thus potentially reflecting higher QOL and lower SB scores than if patients at all stages of the metastatic cancer journey were approached.

This study has identified associations between multiple demographic factors of metastatic breast cancer patients and QOL or SB. Though it is impossible to conclude causal relationships for the noted differences, this research provides valuable information for oncologists. The observed associations between certain factors and QOL and/or SB can be considered to optimize patient care and satisfaction. Additionally, there are large implications for future research with metastatic breast cancer patients, QOL and SB. Identified associations should be further studied to try and uncover why they exist, with the ultimate goal of optimizing QOL and reducing SB for metastatic breast cancer patients.

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Compliance with ethical standards

Conflict of interest None

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