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Exploring diet, physical activity and quality of life in females with metastatic breast cancer: a pilot study to support future intervention

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Abstract

Background—Historically, women with metastatic breast cancer are excluded from lifestyle interventions under the assumptions that diet and physical activity will have little impact on their disease trajectory. However, recent treatment advances have led to significant increases in survivorship that pose challenges to this assumption.

Objective—The objectives of this study were: 1) to measure dietary intake, physical functioning and quality of life (QOL) in a subset of women with metastatic breast cancer, and 2) to inform future interventions in this growing population.

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Design—Demographics, clinical characteristics, dietary intake, physical functioning and QOL were examined cross-sectionally using validated methodologies.

Participants/setting—Twenty-five women with metastatic breast cancer were recruited over a 4 month period (June–September, 2014) from two university hospitals in the Midwest that serve an ethnically diverse patient population. Women completed questionnaires and 24-hour dietary recalls (one weekday, one weekend).

Main Outcome—Lifestyle habits were analyzed.

Statistical analyses—Means ($\pm$ standard deviations) and frequencies were tallied and t-tests were conducted.

Results—On average, participants were 58.8 ($\pm$ 12.8) years of age, predominantly minority, had been living with metastatic breast cancer for an average of 36.9 ($\pm$ 29.3) months, and exhibited significant nutrition impact symptomology (e.g, pain, dry mouth, fatigue.) Bone and lung were the most common sites of metastases. Compared to a larger, normative sample of women with metastatic breast cancer, study participants displayed similar physical ($p=0.61$) and functional well-being scores ($p=0.76$), but higher social ($p=0.10$) and emotional well-being scores ($p<0.01$). The analyses of lifestyle factors showed that the majority of women were overweight or obese ($n=14$), not routine exercisers ($n=15$) and had dietary patterns high in fat and low in fiber.

Conclusions—This study supports that many women with metastatic breast cancer are in need of carefully tailored, evidence-based lifestyle strategies that address symptom burden, including weight management. The implications of diet and physical activity on QOL in this population remain unexplored.

Keywords

metastatic breast cancer; diet; physical activity; quality of life; symptoms; body mass index

Introduction

Breast cancer accounts for more than one-fourth of all new cancer diagnoses among women in the United States, with more than 232,000 new cases estimated for the year 2014.¹ Despite the advances in the management of this disease, a significant number of women will go on to develop metastatic breast cancer, typically reflecting spread to the bone, lungs or viscera.² Johnson et al recently showed that the incidence of metastatic breast cancer *at diagnosis* is increasing, showing greater disparities among younger women (aged 25–39) and minority populations.³ However, the introduction and expansive use of targeted therapies, such as human epidermal growth factor receptor-2 (HER-2) or cyclin-dependent kinase inhibitors, continue to make an exceptional impact on overall survival.^{4–6} Findings of the CLEOPATRA trial (phase III) have revealed unprecedented overall survival in women with metastatic breast cancer treated with dual HER2 blockade.⁷ As such, the number of women living with metastatic breast cancer will continue to grow, reflecting a rapidly expanding sector of the cancer survivor population.

Traditionally, women with metastatic breast cancer are excluded from lifestyle intervention trials under the assumptions that it may be unsafe or pose additional burden to exercise, or

that their disease is progressed and lifestyle changes, such as physical activity and nutrition, will have little impact on their disease trajectory. However, there is growing acknowledgment that persons with metastatic disease can benefit from physical activity to improve physical performance and to help reduce disease-related symptoms.⁸ Although the specific impact of nutrition in this setting is unknown, it is one of the first lifestyle factors that many women with early stage breast cancer modify after diagnosis and/or treatment,⁹ underscoring the need to address this more formally. Furthermore, nutrition and physical activity are key lifestyle factors advocated for all cancer survivors along the survivorship spectrum.¹⁰ For this study, the goals were to: 1) assess dietary intake, physical functioning and quality of life (QOL) in a subset of women with metastatic breast cancer, and 2) inform future lifestyle interventions in this patient population.

Methods

Sample, study location and recruitment

Women were recruited from the Breast Oncology Clinics at two university hospitals in the Midwest that serve an ethnically diverse patient population. Recruitment occurred over a 4 month period (June- September, 2014) and continued until data on 25 women were obtained. Two medical oncologists described the study to patients on clinic days when the PI was present. Eligibility criteria included: 1) female, 2) 18 years of age, 3) undergoing treatment for histologically confirmed metastatic breast cancer, 4) able to speak and understand English, 5) ability to provide informed consent, 6) willing to answer interviewer-administered questionnaires, and 7) accessible and agreeable to be contacted by telephone for follow-up. Patients not meeting all eligibility criteria, deemed too ill for participation by the physician, unwilling to answer questionnaires, pregnant or lactating, and/or non-English speaking patients were excluded. This study was approved the Institutional Review Boards at the University of Illinois at Chicago and Rush University Medical Center.

Study procedures

Once the participant was deemed eligible and interested, written informed consent was obtained and questionnaires were completed to characterize demographics, clinical characteristics, dietary intake, physical functioning and symptoms. Questionnaires were completed in-person by the participant with the assistance of the PI.

Demographic and medical information

Demographic and medical information including age, race/ethnicity, height, weight, living situation (e.g., alone, or with significant other/husband, other family, roommate), employment status (e.g., working full or part-time, unemployed, retired with/without disability), previous breast cancer surgery (e.g., none, lumpectomy, mastectomy), prior radiation treatment (yes/no), sites of metastases (e.g., bone, liver, lung, brain, other) and current breast cancer therapy (hormone, chemotherapy or targeted therapy) were obtained predominantly from the treating medical oncologist and/or the participant, as appropriate.

Nutrition assessment

Self-reported height and weight taken at the clinic visit were used to calculate body mass index (BMI) and to classify participants as normal weight, overweight or obese, using national cut-points.¹¹ Additionally, participants completed the Patient Generated Subjective Global Assessment (PG-SGA); a 4 component nutrition assessment tool that assigns numeric values related to weight patterns, food intake, symptoms, and activities and function. Although this tool is conventionally used to detect levels of malnutrition, where traits such as *unintentional* weight loss and decreased oral intake receive higher scores, it can also be used to globally assess nutritional status (e.g., “well nourished,” “moderately malnourished” or “severely malnourished”) and to quantify nutritional impact symptoms (e.g., nausea, anorexia, taste changes, pain, constipation, etc.) An additive score is used to define specific nutrition and pharmacologic interventions and appropriate referrals to help with symptom management (0-1=no intervention required, 2-3=patient education needed, 4-8=requires intervention by a registered dietitian with a nurse or physician for symptom management, 9 critical need for improved symptom management).¹²

Dietary Intake

Two unannounced 24-hour diet recalls were completed by a Registered Dietitian (RD) trained in the 5-pass dietary recall methodology.¹³ Recalls reflected one weekday and one weekend day and results were entered into the Nutrition Data System for Research [(NDSR) 2012; developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN) for analyses. Macronutrient distribution, number of servings of red/processed meat, fruits, vegetables, grams of dietary fiber and percent whole grains were quantified using NDSR.

Physical activity and functional assessments

The International Physical Activity Questionnaire (IPAQ) is a validated physical activity measurement tool designed for population surveillance.¹⁴ It was developed and tested for use in adults (age range 15-69 years). Participants are queried about the frequency and duration of vigorous, moderate, walking and leisurely activities to classify low, moderate or high physical activity levels. In addition to the IPAQ, each woman was asked to wear a pedometer for one week and to keep a 7-day walking log. Low physical activity levels are equivalent to 5000 steps/d, whereas reports of 12,500 steps/d are consistent with high physical activity levels. This method was undertaken as a result of previous reports that pedometers were an inexpensive, yet reliable method to capture walking activity in women with breast cancer.¹⁵ Further, to help further differentiate physical activity from routine exercise, participants were queried about their routine exercise behaviors (e.g., walking for exercise, specific exercise classes, weight training, etc.)

Performance status was evaluated using the Eastern Cooperative Oncology Group (ECOG) measure. This scale is used by clinicians and researchers to globally assess disease progress, the impact of the disease on daily living abilities and to guide appropriate treatment and prognosis. Grades range from 0-5 (0-2 reflects full activity to compromises in self-care, 3-4 signifies severe limitations in self-care and disability, and 5 reflects no human activity/death.)¹⁶ Further, participants completed the Katz Index of Independence in Activities of

Daily Living (ADL) and Instrumental ADL.¹⁷ Scores on these tools reflect the participants' ability to perform specific every day and usual tasks independently.

Quality of life (QOL)

The ability or desire to engage in healthy lifestyle behaviors may be confounded by QOL, especially in the metastatic setting. To ensure these study participants were comparable to other breast cancer populations, women completed the Functional Assessment of Cancer Therapy-Breast (FACT-B) and the Functional Assessment of Cancer Therapy-Endocrine Symptoms (FACT-ES). These self-report instruments are designed and developed to measure multidimensional QOL, including four specific domains: physical well-being, social/family well-being, emotional well-being, and functional well-being, in addition to concerns regarding breast cancer and endocrine symptoms.¹⁸ The FACT-B reflects a composite score of the first four domains (physical well-being, social/family well-being, emotional well-being, functional well-being) plus nine additional concerns specific to breast cancer (maximum score is 144). The FACT-ES reflects a composite score of the first four domains, the breast cancer subscale items plus 18 items related to endocrine symptoms (maximum score is 220). Each question is scored 0-4 and higher scores on these instruments are indicative of better QOL.

Statistical Analyses

Descriptive statistics were calculated to examine baseline measures and to compare differences stratified by current therapy (hormone vs. chemotherapy), using 2-sample *t* tests for continuous variables and Pearson, chi square, and Fisher's exact test for categorical variables. QOL subscale scores were analyzed for differences between study participants vs. other women with breast cancer. Specifically, normative subscale scores were obtained from Fallowfield et al¹⁸ and utilized to compare scores of present study participants to those of a representative sample of women with all stages of breast cancer (n=268) and to a representative sample of women with metastatic breast cancer (n=98), exclusively. Finally, to improve translation and comparability to other studies, results of the ADL and IADL assessments were reverse scored, where a score of 0 was indicative of full function, 2 indicated moderate impairment, and 4 or more indicated severe functional impairment. Data were analyzed using Stata Statistical Software (version 13, 2013, StataCorp, College Station, TX). A *p* value of <0.10 was used to denote statistical significance based on the exploratory nature of this study.

Results

Twenty-nine women were approached for study inclusion within a four month study time frame; four women declined due to lack of interest or time and two participants who provided baseline data did not complete the second dietary recall or 7-day pedometer data. The majority of participants (n=15) were recruited from one site due to an overall higher volume of patients. (Table 1) In general, women were 58.8 ($\pm$ 12.8) years of age, predominantly minority (n=15), currently living with family and retired from work. The majority of women were classified as well nourished (n=23) and those on hormone therapies had a significantly higher mean BMI compared to women receiving chemotherapy (31.1 $\pm$

6.0 vs. 25.0 ± 4.0 , respectively, $p=.009$). However, the average total PG-SGA score was 5.9 ± 5.6 , which was largely driven by the nutrition symptoms subscale score (5.0 ± 4.6 .) Women who were currently receiving chemotherapy treatment tended to experience greater nutrition impact symptomology (e.g., pain, dry mouth, fatigue, constipation) and higher PGSGA total scores vs. those receiving hormone based therapies (6.6 ± 5.6 vs. 3.6 ± 2.8 , respectively, $p=0.13$ and 8.0 ± 7.0 vs. 4.0 ± 3.3 , respectively, $p=0.10$). Bone and lung were the most common sites of metastases, and ECOG performance scores tended to reflect slightly better performance status in women receiving hormone therapy vs. chemotherapy treatments (0.5 ± 0.5 vs. 1.1 ± 1.2 , respectively, $p=0.12$).

The QOL subscale scores are shown in Table 2. Comparisons were made between normative scores and study participants, using normative data generated from women with all stages of breast cancer and from women with metastatic breast cancer (Stage IV disease.)¹⁸ Physical well-being scores were significantly lower for study participants when compared to women with all stages of breast cancer (21.8 ± 5.1 vs. 23.8 ± 4.9 , $p=0.05$); however, these scores were similar when compared to other women with advanced breast cancer (21.8 ± 5.1 vs. 22.4 ± 5.3 , $p=0.61$.) Specifically, 72% ($n=18$) of the women in this study reported pain symptoms and 92% ($n=23$) reported fatigue (Data not shown.) Study participants also demonstrated higher emotional well-being scores compared to other women with breast cancer (18.6 ± 4.0 vs. 16.1 ± 3.3 , $p<0.01$) and compared to women with advanced disease (18.6 ± 4.0 vs. 15.6 ± 3.8 , $p<0.01$). Further, study participants tended toward higher social well-being compared to women with advanced breast cancer (21.7 ± 6.5 vs. 19.7 ± 5.0 , $p=0.10$.) Specifically, 84% ($n=21$) of women did not express any loss of hope in their fight against their illness, 48% ($n=12$) were ‘not at all’ worried about dying and 72% ($n=18$) responded they had ‘very much’ support from their friends. (Data not shown.)

Table 3 highlights lifestyle behaviors advocated during cancer survivorship.¹⁰ Fifty-six percent ($n=14$) of participants were classified as either overweight (BMI 25.0-29.9) or obese (BMI ≥ 30.0). Overall, 44% ($n=11$) of women endorsed concerns regarding weight gain on the endocrine subscale. Of these ($n=11$), four were classified as overweight and four were classified as obese. Additionally, of the four women who reported a history of weight loss over the preceding 6 months on the PGSGA, two experienced *unintentional* weight loss while two had successfully engaged in weight loss efforts. (Data not shown) Despite ADL and IADL scores reflective of a group of participants with few limitations in their daily functions, the minority of participants reported routine exercise ($n=10$). Although 80% ($n=20$) of women walked every day “for at least 10 minutes at a time,” only 5 reported using walking as part of their routine exercise plan. The other five women participated in other structured exercise activities and none of the participants reported strength training exercises. (Data not shown) Only 20 women wore the provided pedometers during the week of study participation; four reported no problems, eight had issues with the device resetting, six experienced problems with it falling off/failing to record steps and four lost the device. Due to these difficulties, the pedometer data were not analyzed. The average reported caloric intake was 1520 ± 491 kcals/d. With regard to the dietary intake patterns, 48% ($n=12$) of women consumed ≥ 5 servings/d of fruit + vegetables and 8% ($n=2$) ate $\geq 50\%$ of total grains as whole grains. In addition, 24% ($n=6$) of women reported no red or processed meat

intake and only 16% (n=4) of women reported consuming alcoholic beverages. (Data not shown)

Discussion

Managing symptoms to maintain optimal QOL is the major goal of care in the metastatic setting, as all therapy is considered palliative and these women will eventually succumb to their disease. Nevertheless, as treatment options continue to expand and survivorship is prolonged, it is critical to identify modifiable behaviors to further optimize survivorship. This pilot study was initiated after several women with metastatic breast cancer responded to recruiting efforts for a larger behavioral weight loss trial being conducted locally. Consistent with other lifestyle interventions, these women were ineligible due to their Stage IV diagnosis. However, rather than rely on subjective reports from a few women, it was deemed important to more formally examine the needs and interest of women with metastatic breast cancer using validated methodologies. As evidenced by their reported treatment side-effects, nutrition-impact symptoms and issues concerning weight management, results of this study support that a subset of these women would potentially benefit from participation in lifestyle interventions.

Previously, Cheville et al demonstrated that many women with metastatic breast cancer report physical functioning challenges, ranging from mild impairments to disability.¹⁹ These findings may, in part, help to explain the limited physical activity interventions conducted in this population. Previously, Headley et al investigated the impact of a seated exercise program on QOL in 38 women with metastatic breast cancer initiating chemotherapy treatment. As expected, QOL scores decreased as chemotherapy progressed in both the intervention and control participants; however, women in the intervention group exhibited a significantly slower decline in total and physical well-being scores ($p=0.03$) and a more blunted increase in fatigue scores than those randomized to the control group ($p=0.008$).²⁰ Jones et al examined cardiopulmonary fitness using peak oxygen consumption (VO_{2peak}) in four cohorts of female breast cancer survivors, including 51 women with metastatic breast cancer. Forty-four percent of the women with metastatic breast cancer had VO_{2peak} levels less than their healthy counterparts, reflecting the worst scores overall and decreased survival.²¹ Cormie et al recently published findings from a small (n=20) 3-month supervised resistance exercise trial conducted in a mixed patient population involving prostate and breast cancer survivors with bone metastases. This feasibility study demonstrated not only the safety and tolerability of this approach, but showed initial and continued improvements in functional ability, physical activity, muscle (whole body and appendicular lean mass) and QOL.²² As noted by the authors, the clinical relevance for these findings included: 1) a sustained ability to regain a more “normal” lifestyle, 2) the capability to perform resistance exercise at an intensity required to produce gains in lean mass and skeletal integrity, and 3) increased social function, perhaps from group exercise and/or rapport with the exercise interventionists.

In the present study, only 40% (n=10) of women participated in exercise on a regular basis and several participants verbalized uncertainty and frustration regarding the safety of exercise with their disease. This is especially concerning since nearly half were worried

about treatment-associated weight gain; a common observation among women with early stage disease following breast cancer treatment.²³ Walking was the most frequent form of exercise; however, this may have been influenced by the seasonality of the data collection during the summer months. Despite the paucity of data in women with metastatic breast cancer, the studies by Headly et al,²⁰ Jones et al²¹ and Cormie et al²² jointly reflect the need, desire and capabilities of these patients to engage in exercise. Further, they underscore the lack of dietary interventions conducted exclusively in women with metastatic breast cancer. The Womens Nutrition Intervention Study (WINS)²⁴ and the Womens Healthy Eating and Living Study (WHELS)²⁵ are two of the most widely known dietary interventions conducted among large groups of breast cancer survivors. Although these studies did not include women with metastatic breast cancer, they reveal pre-intervention mean energy intakes of 1659 ($\pm$ 417) and 1717 ($\pm$ 11) kcals, respectively. In addition, women in the WHELS consumed 3.8 ($\pm$ 0.05) servings of vegetables, 3.4 ($\pm$ 0.05) servings of fruit and 21.2 ($\pm$ 0.20) grams of fiber/d. Overall intakes of energy, fruits, vegetable and fiber in these studies were higher than those reported by the women in the present study (shown in Table 3), despite similar dietary assessment methodologies. A number of randomized controlled trials have simultaneously investigated the combined effects of *diet and physical activity* in women with **early** stage disease.²⁶⁻²⁹ Results from these particular behavioral trials clearly indicate the joint effectiveness of such interventions to facilitate weight loss and to favorably decrease adiposity.²⁷⁻²⁹ Although findings in women diagnosed and treated for **early** stage breast cancer cannot be extrapolated to women with metastatic breast cancer, these studies underscore the importance of weight control, regular exercise and healthy eating to enhance survivorship.

Based on scientific evidence and best clinical practices, the ACS convened a group of experts in nutrition, physical activity and cancer survivorship to create nutrition and physical activity guidelines for cancer survivors. These guidelines are intended to provide health care providers with the best possible information with which to help cancer survivors make informed choices about lifestyle habits, including diet and exercise.¹⁰ Theoretically, women with metastatic breast cancer would be referred to the subsection entitled ‘living with advanced cancer’; however, this section is framed for individuals struggling with weight loss, diminished appetite and signs and symptoms of malnutrition. As evidenced by the PG-SGA assessments, the participants in this study were predominantly well-nourished (n=23), yet they struggled with significant nutrition-impact symptomology achieving scores that would warrant referral to a Registered Dietitian for assistance with symptom management. It is clear that these guidelines have limited applicability for a subset of women living with advanced breast cancer, highlighting the breadth of survivorship in the metastatic setting. More importantly, these pilot study findings clearly identify a research gap to better inform these survivorship guidelines reinforcing a strong need to develop and test the impact of carefully tailored lifestyle interventions for women living with metastatic breast cancer.

Prior to launching a lifestyle intervention in this clinical population, it is critical to assess disease burden and QOL. That is, women with increased symptomology and treatment side-effects may not be appropriate candidates for such interventions, since participation could be physically burdensome and result in compromises in QOL. The FACT-B and FACT-ES,

widely used multidimensional QOL measures, were validated in a population of women with Stage I-IV breast cancer by Fallowfield et al.¹⁸ Separate QOL scores for women with Stage IV disease were intentionally provided, based on the known differences in these women compared to those with early stage disease. These original analyses included two questions pertaining to 'relationship with doctor' no longer used when scoring these instruments; thus, inflating overall QOL scores by 8 points and allowing only comparisons across subscale domains to maintain validity. Women in the present study reported lower physical well-being (21.8 ± 5.1 vs. 23.8 ± 4.9 , respectively, $p=0.05$) compared to women across all stages of breast cancer (i.e., Stages I-IV). However, when specifically compared to women with Stage IV disease, women in this study had similar physical ($p=0.61$) and functional well-being subscale scores ($p=0.76$). Although women who agreed to participate in this study were likely interested and motivated to adhere to healthy lifestyle habits, interestingly these findings do not suggest that women in this study were substantially more fit compared to a broader, more representative group of women with metastatic breast cancer.

While this study is one of the first to assess diet, physical functioning and QOL during survivorship in women with metastatic breast cancer, there are several limitations that deserve careful consideration. First, there is an inherent selection bias regarding study participation resulting in restrictions regarding generalizability. It remains unclear how well the women who participated in this study reflect the general population of women with this disease. Larger studies in this population are needed to better address this concern. Second, while this study utilized 24-hour dietary recalls to quantify dietary intake patterns, results may not accurately reflect usual dietary intake based on the short duration of this study. This may also explain the observed differences in energy, fruit, vegetable and fiber intake in the present study compared to larger intervention trials.^{24,25} Third, participants' experienced substantial difficulties quantifying time spent walking (question 6) and sitting (question 7) during the administration of the IPAQ. Therefore, it was decided *a priori* not to calculate metabolic equivalent scores, as they would misrepresent the physical activity efforts of this population. Unfortunately, practical problems with the lost, broken or forgotten pedometers did not allow for the validation of these data. More sophisticated technologies that accurately track movement and time spent sitting should be used in future studies. Finally, while the intent of this cross-sectional study was hypothesis generation, the number of participants in this study was small and results are prone to type II errors (i.e., a true association or difference actually exists in a larger population.)

Conclusions

The landscape of survivorship for women with metastatic breast cancer is quickly changing, exhibiting considerable improvements in the last five years. Combined with the escalating incidence of metastatic breast cancer in younger women, researchers and clinicians are now faced with mounting task of providing these particular women with appropriate evidenced-based guidelines to enrich their survivorship. This pilot study demonstrated that regardless of current therapy, many women living with metastatic breast cancer struggle with significant treatment side-effects, including weight management. Whether or not diet and physical activity can improve symptom burden and QOL, the focal point of care in the

metastatic setting, remains virtually unexplored. Therefore, it is paramount that future investigators recognize and address the needs of this growing population and develop appropriately tailored lifestyle interventions that are safe, empowering and efficacious.

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Table 1
Demographics and clinical characteristics of women with metastatic breast cancer stratified by current therapy (hormone vs. chemotherapy based treatment)^a

Characteristic	Total ^b N=25	Hormone therapy n=11	Chemotherapy n=12	P value
Age, years (mean $\pm$ SD)	58.8 $\pm$ 12.8	62.6 $\pm$ 11.6	58.5 $\pm$ 11.8	0.4060
Race/ethnicity (n, %)				
Non-Hispanic White	8 (32)	3	4	0.951
African-American	12 (48)	6	6	
Other ^c	5 (20)	2	2	
Living Situation (n, %)				
Alone	2 (8)	9	11	0.560
Spouse and/or family	22 (88)	1	1	
Other	1 (4)	1	0	
Employment Status (n, %)				
Working full time	4 (16)	2	1	0.399
Working part time	2 (8)	2	0	
Retired without disability	12 (48)	6	6	
Retired with disability	4 (16)	1	2	
Unemployed	3 (12)	0	3	
Stage IV at diagnosis (n, %)	8 (32)	4	2	0.283
Duration of MBC (months; mean $\pm$ SD)	36.9 $\pm$ 29.3	33.5 $\pm$ 22.6	30.5 $\pm$ 24.0	0.7647
Metastatic sites				
1-2	21 (84)	9	10	0.924
>2	4 (16)	2	2	
Location ^d				
Bone	14 (56)	7	5	0.292
Liver	4 (16)	1	3	0.315
Lung	13 (52)	6	7	0.855
Brain	6 (24)	1	3	0.315
Other	6 (24)	3	3	0.901
Radiation therapy for metastases (n, %)	12 (48)	4	6	0.510
Surgery for breast cancer (n, %)				
None	9 (36)	4	5	0.827
Lumpectomy	6 (24)	2	3	
Mastectomy	10 (40)	5	4	
ECOG (mean $\pm$ SD) ^e	0.8 $\pm$ 0.9	0.5 $\pm$ 0.5	1.1 $\pm$ 1.2	0.1152
PGSGA ranking (n, %)				
Well nourished	23 (92)	11	10	0.366
Malnourished	2 (8)	0	2	

Characteristic	Total ^b N=25	Hormone therapy n=11	Chemotherapy n=12	P value
PGSGA scores (mean $\pm$ SD) ^f				
Nutrition impact symptoms	5.0 $\pm$ 4.6	3.6 $\pm$ 2.8	6.6 $\pm$ 5.6	0.1291
Total score	5.9 $\pm$ 5.6	4.0 $\pm$ 3.3	8.0 $\pm$ 7.0	0.1047

^a Abbreviations: MBC = Metastatic breast cancer; SD= standard deviation; ECOG=Eastern Cooperative Oncology Group; PGSGA= Patient Generated Subjective Global Assessment

^b Two participants were on targeted therapies only and not included in the comparative analyses.

^c Other includes three Hispanic participants.

^d Not mutually exclusive.

^e ECOG scores range from 0-5 with 0 =full activity and 5= death.

^f PGSGA Scores of 0-1 = no intervention required, 2-3 points =patient education needed, 4-8 points = requires intervention by a Registered Dietitian with a nurse or physician for symptom management, and 9 points = critical need for improved symptom management

Table 2
Functional Assessment of Cancer Therapy - Breast and Endocrine Symptoms Quality of Life results for women with metastatic breast cancer compared to breast cancer population normative scores

FACT QOL ^{ab} Subscales	Range	Study Score (n=25)	Women with all stages of breast cancer normative score ^c (n=268)	P value ^d	Women with metastatic breast cancer normative score ^e (n=98)	P value ^f
Physical well-being	7 item (0-28)	21.8 (5.1)	23.8 (4.9)	0.05	22.4 (5.3)	0.61
Social well-being	7 item (0-28)	21.7 (6.5)	20.5 (5.2)	0.28	19.7 (5.0)	0.10
Emotional well-being	6 items (0-24)	18.6 (4.0)	16.1 (3.3)	<0.01	15.6 (3.8)	<0.01
Functional well-being	7 items (0-28)	19.8 (5.0)	20.7 (6.1)	0.48	19.4 (6.1)	0.76
Breast cancer	9 items (0-36)	25.9 (5.5)	25.2 (6.0)	0.75	24.1 (6.3)	0.19
Endocrine symptoms	18 items (0-72)	60.0 (8.7)	59.7 (9.2)	0.11	60.6 (8.5)	0.75

^a Abbreviations; FACT= Functional Assessment of Cancer Therapy, QOL= Quality of life

^b Higher scores are indicative of better QOL. Each question is scored 0-4 with possible ranges for each subscale specified.

^c Normative results from Fallowfield et al¹⁸ for women with **all** stages of breast cancer

^d Comparing study participants to women with all stages of breast cancer

^e Normative results from Fallowfield et al¹⁸ for women with **advanced** breast cancer

^f Comparing study participants to women with advanced breast cancer

Table 3
Lifestyle factors of women with metastatic breast cancer stratified by current therapy
(hormone therapy vs. chemotherapy based treatment)^a

Characteristic	Total ^b N=25	Hormone therapy n=11	Chemotherapy n=12	P value
Body mass index ^c (mean ± SD)	27.9 ± 5.8	31.1 ± 6.0	25.0 ± 4.0	0.0091
Normal (n, %)	11 (44)	3	6	0.163
Overweight (n, %)	6 (24)	2	4	
Obese (n, %)	8 (32)	6	2	
Reports routine exercise (n, %)	10 (40%)	5	4	0.552
No. of ADL problems (mean ± SD)	0.1 ± .5	0.2 ± .6	0.1 ± .3	0.6176
No. of IADL problems (mean ± SD)	1.2 ± 2.3	0.5 ± 1.8	1.8 ± 2.7	0.1928
Daily dietary intake (mean ± SD) ^d				
Total caloric intake	1520 (± 491)	1590 (± 488)	1458 (± 506)	0.5364
% calories from CHO	46.7 (± 7.5)	46.5 (± 6.3)	46.7 (± 8.8)	0.9979
% calories from protein	16.9 (± 4.6)	17.5 (± 5.5)	16.6 (± 3.9)	0.5738
% calories from fat	36.4 (± 7.5)	36.0 (± 6.7)	36.7 (± 8.5)	0.9318
Fruits and vegetable servings	4.6 (± 3.2)	4.7 (± 3.6)	4.6 (± 2.9)	0.9627
Dietary fiber (gms)	15.0 (± 7.4)	16.4 (± 9.2)	13.8 (± 5.5)	0.4147

^a Abbreviations: SD= standard deviation; ADL= Activities of Daily Living; IADL = Instrumental Activities of Daily Living; CHO= carbohydrate

^b Two participants were on targeted therapies only and not included in the comparative analyses.

^c Classified obese if body mass index ≥ 30.0 and overweight if body mass index 25.0-29.9. BMI range was 19.6 - 40.0 kg/m².

^d Dietary intake was averaged for the 23 women with two 24-hour diet recalls. For two participants only one 24-hour recall was provided.