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Early Stage Breast Cancer and Its Association with Diet and Exercise-Related Perceptions and Behaviors to Prevent Recurrence

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Abstract

Background: The favorable prognosis for early stage breast cancer survivors may be a reason for the minimal research regarding their quality of life. Prior research has observed more long-term weight gain among early stage survivors compared to cancer-free women of a similar age. It would be useful to study survivors' perceptions and reported behaviors regarding diet and exercise to see if there is a correlation with previous studies.

Methods: A sample of 700 breast cancer survivors from Ohio and Michigan was randomly selected from the Northwest Ohio affiliate of the Susan G. Komen For the Cure mailing list and sent a survey for completion.

Results: 389 survivors completed the survey and among Stage 1 (50/197 = 25.4%) and Stage 2 survivors (24/105 = 22.9%), a small proportion had a positive correlation between self-reported dietary behaviors and their perceived benefits of eating fruits and vegetables. Similar correlations were observed between their self-reported exercise behaviors and their perceived benefits of exercise (Stage 1: 36/197 = 18.3%, Stage 2: 18/105 = 17.1%).

Conclusions: Regardless of stage, a small proportion of survivors' self-reported dietary and exercise behaviors match their perceived benefits of diet and exercise. Factors such as access, motivation, and lack of co-morbidities among early stage survivors may prevent them from living healthier post-diagnosis. More thorough dietary and clinical measurements will provide greater certainty. Thus, innovative, sustainable programs must be accessible and provide motivation and social support from family, friends, and other survivors to truly improve quality of life.

Keywords: breast cancer, diet, exercise, activity

Breast Cancer: Basic and Clinical Research 2010:4 65–72

doi: [10.4137/BCBCR.S6265](https://doi.org/10.4137/BCBCR.S6265)

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Introduction

In large part because of the available treatment options and favorable prognosis for women diagnosed with *in situ* and early stage breast cancer, little attention has been given to quality of life issues in this population.¹ Survival after breast cancer is strongly related to stage at diagnosis, as increasing stage increases the risk of death.²⁻⁴ However, length of survival following breast cancer diagnosis varies considerably, even after accounting for stage and treatment, thus suggesting that there are other important factors involved.^{5,6} As the population of breast cancer survivors in the United States continues to grow, it is important to identify lifestyle and behavioral factors that may improve survival and quality of life.^{7,8}

Following breast cancer diagnosis, women often attempt to modify their lifestyles in an attempt to improve ward off death, improve their health and prevent a recurrence of breast cancer.^{5,6,9-15} These behavioral changes typically involve dietary modification where survivors increase their intake of fruits and vegetables and decrease fat intake;^{11,16,17} and increase physical activity which may help them to lose weight and adipose tissue.¹⁸⁻²⁰ Further, those survivors who view that dietary modification may reduce their risk of recurrence tend to also believe in the benefits of and engage in exercise and weight maintenance activities.^{5,6,9-20} Plant-based products including fruits, vegetables, grains, and soy products, which are rich in flavonoids, have been associated with prolonged survival in numerous population-based studies.^{7,11,21-23} The American Cancer Society and the United States Department of Agriculture recommend eating five or more servings of fruits and vegetables each day to help prevent cancer.^{24,25} The same recommendation is given to cancer survivors, along with maintaining a healthy body weight and performing regular exercise.²⁶

Obesity at diagnosis adversely affects survival among post-menopausal women.²⁷⁻³¹ In contrast, exercise has been associated with improved prognosis in women with breast cancer.³²⁻³⁵ Moreover, weight loss interventions have improved physical and functional quality of life measures among early-stage breast cancer survivors who were struggling with their health.^{14,36}

However, when it comes to medical advice regarding healthy lifestyle behaviors, Royak-Schaler et al³⁷ found that breast cancer survivors who were at

greatest risk for recurrence reported less guidance from physicians about evidence-based, follow-up care guidelines. A 2006 Report from The Institute of Medicine (IOM) identified a gap in the dissemination of evidence-based guidelines by health care providers to their cancer patients following completion of primary cancer treatment.³⁸ This finding underscores a potentially larger problem for survivors who completed their treatment years ago. In the Life After Cancer Epidemiology (LACE) study, researchers followed women for an average of 5.6 years following Stage I or II breast cancer diagnosis and found they had similar exercise patterns as women who were cancer free. Younger women in the study also gained more weight than expected.³⁹ Thus, it is possible that these long-term, early stage survivors may be receiving little or no medical advice regarding diet and exercise in part due to fewer medical visits and lower perceived risk of cancer recurrence.

Despite the increasing volume of research regarding the benefits of a healthy diet and physical activity to improve breast cancer prognosis and quality of life after diagnosis, it is unclear if breast cancer survivors are aware of and are applying this knowledge. Armed with the knowledge they do possess, do breast cancer survivors' perceptions of diet and physical activity correlate with their self-reported diet and activity? Given the myriad of research findings and means of disseminating the results to the general public, it could be hypothesized that many women are uncertain in not only how to modify their behavior after diagnosis, but also what perceived benefits, if any, exist from these modifications?

Thus, the purpose of our study was to determine the relationship, if any, between Stage I and II breast cancer survivors' perceptions and self-reported behaviors related to diet and physical activity. Further, we aimed to determine if this relationship varied by stage at diagnosis. We hypothesized that Stage II survivors would be more likely to perceive the benefits of a healthy diet and be more likely to report consuming fruits and vegetables and exercising compared to Stage I survivors.

Methods

Sample

Researchers from the University of Toledo collaborated with The Northwest Ohio Affiliate of the



Susan G. Komen For the Cure Foundation to conduct a regional needs assessment of the 24 counties covered by the Northwest Ohio Affiliate, which includes counties in northwest Ohio and southeast Michigan. As part of the needs assessment, an institutional review board (IRB)-approved survey was sent to a random sample of 700 breast cancer survivors at all stages from I to IV using the Komen Foundation mailing list in February 2009. A three-wave mailing procedure was used to maximize the response rate.

The first mailing included 1) a personalized, hand-signed cover letter that introduced the study, requested the confidential participation of the recipient, and provided directions for returning the survey; 2) a copy of the survey printed on colored paper; 3) a \$2.00 bill as an incentive for participation; and 4) a return envelope addressed to the principal investigator with a first-class postage stamp. The second and third mailings included all of the above except the incentive. Return of the completed survey served as consent for use of the answers supplied. A total of 389 survivors returned their survey (55.6% return rate). Of these, 302 survivors had been diagnosed with Stage I or II breast cancer and were included in the data analysis.

Survivors reported the impact of their breast cancer on various aspects of their lives using a Likert-type rating scale ranging from 'major negative' to 'major positive'. Perceptions regarding breast self-exams, mammography, and diet were recorded with a scale ranging from 'strongly disagree' to 'strongly agree'. Diet perceptions were assessed with questions that assessed actual dietary and physical activity behaviors through the following questions, "Do you typically eat at least 5 serving fruits/vegetables per day?" and "Do you typically engage in moderate exercise of 30 or more minutes per day for 5 or more days per week?"

Statistical methods

All data were analyzed with Statistical Analysis Software (SAS) Version 9.1.⁴⁰ Univariate analyses were performed to obtain descriptive data regarding the distribution of variables throughout the survey. Cross-tabulations of survivor perceptions and actual behavior were generated by stage of breast cancer diagnosis. Spearman correlation coefficients⁴¹ were used to test the hypothesis of correlation between the qualitative data from the dietary perception statement

and self-reported diet and physical activity behavior questions.

Odds ratios (OR) and 95% confidence intervals (CI) for the associations between stage at diagnosis and perceptions or self-reported behaviors were estimated using unconditional logistic regression,⁴⁰ excluding the term for age due to the relatively homogeneous age distribution of post-menopausal survivors. Perceptions of diet and exercise were dichotomized by combining those who agreed or strongly agreed into one level and those who disagreed, strongly disagreed, or were unsure into the second level.

Effect modification was examined through use of stratified analysis and by comparing the log-likelihood statistic for models that included multiplicative interaction terms to those without.⁴⁰ Potential modifiers included stage, education, income, body mass index (BMI), tobacco use, alcohol intake (drinks/month), and hormone replacement therapy (HRT). None of these covariates were found to modify the association between perceptions and self-reported behaviors related to diet and exercise based on a *P*-value of 0.05. Potential confounders included those considered as effect modifiers. Confounding was assessed using backward elimination with multivariable models. None of the potential confounders altered effect estimates for diet and exercise perceptions by more than 10% (data not shown).

Results

The mean age of the survivors was 60.7 years (SD = 10.5), coinciding with the fact that most were post-menopausal (234/282 = 83.0%, 20 had missing data for menopausal status) (data not shown). The mean time since first diagnosis to survey administration was 9.1 years (SD = 5.7).

To assess how survivors' dietary perceptions coincided with their self-reported dietary behaviors by stage at diagnosis, we cross-tabulated their responses to the statement "Eating at least 5 servings of fruits/vegetables per day will reduce the risk of breast cancer recurrence" with the question "Do you typically eat at least 5 servings of fruits/vegetables per day?" (Table 1). Among Stage 1 survivors, 50 of 101 (49.5%) who agreed or strongly agreed that eating at least five servings of fruits and vegetables per day will reduce the risk of breast cancer recurrence reported consuming at least 5 servings



Table 1. Comparison of survivor agreement regarding eating the recommended amount of fruits and vegetables per day and self-reported dietary behavior by stage.

Level of agreement¹					
Consume \geq 5 fruits or vegetables per day²	Strongly agree N = 28 N (%)	Agree N = 73 N (%)	Not sure N = 69 N (%)	Disagree N = 13 N (%)	Strongly disagree N (%)
Stage 1 (n = 197)					
Yes	16 (57.1)	34 (46.6)	21 (30.4)	2 (15.4)	0 (0.0)
No	10 (35.7)	24 (32.9)	29 (42.0)	5 (38.5)	0 (0.0)
Not sure	2 (7.2)	15 (20.5)	19 (27.6)	6 (46.1)	0 (0.0)
<i>Missing (n = 14)</i>					
Spearman's rho	0.19				
P-value	0.03				
Stage 2 (n = 105)					
Consume \geq 5 fruits or vegetables per day²	Strongly agree N = 14 N (%)	Agree N = 37 N (%)	Not sure N = 38 N (%)	Disagree N = 6 N (%)	Strongly disagree N = 2 N (%)
Yes	7 (50.0)	17 (46.0)	9 (23.7)	3 (50.0)	0 (0.0)
No	5 (35.7)	14 (37.8)	19 (50.0)	2 (33.3)	2 (100.0)
Not sure	2 (14.3)	6 (16.2)	10 (26.3)	1 (16.7)	0 (0.0)
<i>Missing (n = 8)</i>					
Spearman's rho	0.21				
P-value	0.06				

Notes: ¹Based on agreement with the statement: "Eating at least 5 fruits/vegetables per day will reduce the risk of breast cancer recurrence". ²Based on survivor response to the question: "Do you typically eat at least 5 servings of fruits/vegetables per day?".

of fruits/vegetables per day. Similar results were observed among Stage 2 survivors.

To assess how survivors' perceived benefits of eating fruits and vegetables (ie, reducing the risk of recurrence) coincided with their self-reported physical activity behaviors by stage at diagnosis, we cross-tabulated their responses to the statement "Eating at least 5 servings of fruits/vegetables per day will reduce the risk of breast cancer recurrence". with the question "Do you typically engage in moderate exercise of 30 or more minutes per day for 5 or more days per week?" (Table 2). Combining the Stage 1 and 2 survivors, 35.3% who agreed or strongly agreed that eating fruits and vegetables will reduce the risk of breast cancer recurrence reported engaging in the recommended amount of physical activity. Many survivors who were uncertain of the perceived benefits of healthy eating reported not engaging in the recommended amount of physical activity. Though there were greater perceived benefits and more self-reported healthy diet and weight maintenance activities among Stage 2 survivors, as evidenced by

the inverse associations observed, none of the odds ratios were statistically significant (Table 3).

Discussion and Conclusion

In assessing the perceptions and behaviors of breast cancer survivors, several noteworthy results were observed. The majority of early stage diagnosis survivors in the present study did not agree that eating at least 5 servings of fruits and vegetables per day would reduce their risk of breast cancer recurrence. Prior studies have demonstrated that women with Stage 3 and Stage 4 breast cancer at diagnosis are more likely to believe in behavioral and lifestyle changes to improve their health and well-being.^{9,12,22,42-45} However, the relatively moderate proportions of survivors in the present study reportedly consumed the recommended daily servings of fruits and vegetables demonstrate other reasons for women not improving their diet. Both the WHEL Study and the Women's Intervention Nutrition Study found breast cancer survivors struggled with their long-term compliance of



Table 2. Comparison of survivor agreement regarding eating the recommended amount of fruits and vegetables per day and self-reported physical activity by stage.

Level of agreement¹					
Engaging in regular physical activity²	Strongly agree N = 29 N (%)	Agree N = 73 N (%)	Not sure N = 66 N (%)	Disagree N = 13 N (%)	Strongly disagree N (%)
Stage 1 (n = 197)					
Yes	14 (48.3)	22 (30.1)	23 (34.3)	2 (15.4)	0 (0.0)
No	13 (44.8)	36 (49.3)	24 (35.8)	7 (53.8)	0 (0.0)
Not sure	2 (6.9)	15 (20.6)	19 (28.4)	4 (30.8)	0 (0.0)
<i>Missing (n = 16)</i>					
Spearman's rho	-0.04				
P-value	0.64				
Stage 2 (n = 105)					
Engaging in regular physical activity²	Strongly agree N = 14 N (%)	Agree N = 37 N (%)	Not sure N = 38 N (%)	Disagree N = 6 N (%)	Strongly disagree N = 2 N (%)
Yes	5(35.7)	13 (35.1)	14 (36.8)	1 (16.7)	0 (0.0)
No	5 (35.7)	17 (46.0)	15 (39.5)	3 (50.0)	2 (100.0)
Not sure	4 (28.6)	7 (18.9)	9 (23.7)	2 (33.3)	0 (0.0)
<i>Missing (n = 8)</i>					
Spearman's rho	0.02				
P-value	0.85				

Notes: ¹Based on agreement with the statement: "Eating at least 5 fruits/vegetables per day will reduce the risk of breast cancer recurrence". ²Based on survivor response to the question: "Do you typically engage in moderate exercise of 30 or more minutes per day for 5 or more days per week?".

eating a healthy diet.^{46,47} It is possible that the weak correlation between perceptions and self-reported behaviors may include a lack of innovative and sustainable intervention and counseling methods near their place of residence,⁴⁷ limited knowledge regarding a healthy diet and its benefits,^{7,32} and lack of motivation to change their diets.⁴⁸ It is also possible that they are now living their life to the fullest by traveling, taking more risks, having more fun, and eating and drinking what they want; which was

reported frequently in our focus groups by a separate sample of area breast cancer survivors.

Similar issues regarding survivors' dietary perceptions and behaviors may exist with their physical activity behaviors. Encouragingly, as stage of breast cancer increased from Stage 1 to Stage 2, so did the proportion of women who not only agreed that eating fruits and vegetables would reduce their risk of recurrence but also reportedly engaged in regular, moderate physical activity. This finding stresses the importance

Table 3. Associations of stage at diagnosis with perceptions and self-reported diet, exercise, and weight maintenance behaviors.

	Perceived benefits of fruit and vegetable intake	Perceived benefits of exercise	Perceived benefits of healthy weight
Stage at diagnosis	OR (95% CI) 0.89 (0.54–1.55)	OR (95% CI) 1.13 (0.65–1.95)	OR (95% CI) 0.79 (0.47–1.32)
P-value	0.65	0.67	0.37
	Self-reported fruit and vegetable intake	Self-reported exercise	Self-reported BMI
Stage at diagnosis	0.85 (0.50–1.44)	1.07 (0.62–1.84)	0.81 (0.50–1.31)
P-value	0.54	0.81	0.39



of prognosis on desire to change lifestyle behavior. A later stage at diagnosis may be more of an impetus for breast cancer survivors to modify their lifestyle behaviors. Likewise, Stage 2 survivors in this sample were more likely to be physically active. A later stage of diagnosis may be tied to a higher sense of perceived vulnerability and perceived severity. Those that are diagnosed at later stages are more likely to have a greater sense of risk of death and these perceptions of risk may be linked with their level of motivation to engage in healthy behaviors.

Combining innovative physical activity interventions with innovative dietary interventions may be a suitable approach to develop sustainability of healthy behaviors in this population. If breast cancer survivors understand the importance of exercising and can exercise with other survivors in a place where they feel safe and secure, the more likely they are to engage in this behavior. Thus, provision of resources to facilitate survivors' ability to follow recommendations and improve their health and well-being would be prudent.

The WHEL study has found that the consumption of vegetable juice provides a relatively easy way for participants to consume a concentrated source of micronutrients and phytochemicals; and to maximize intake of nutrient-dense produce survivors need to be encouraged to eat whole fruit rather than fruit juice, and colorful and flavorful vegetables rather than iceberg lettuce and white potatoes.⁴⁷ In addition to dietary counseling, cooking classes that provide hands-on experience with foods, and printed materials may have an additive effect on promoting behavior change.⁴⁷

Cancer treatment, barriers to exercise and a negative affect post-diagnosis may affect self-reported exercise behavior. Our results are similar to those of the Life After Cancer Epidemiology (LACE) study, which observed that women who were followed for an average of 5.6 years following Stage I or II breast cancer diagnosis had similar exercise patterns as women who were cancer free and younger women gained more weight than expected.³⁹ It was suggested that in the early years post-diagnosis that breast cancer survivors exhibit similar behavior patterns to the general population. The average time since diagnosis among the breast cancer survivors in our sample was 9.1 years (SD = 5.7 years). Since the perceived exercise benefits and self-reported exercise

were not particularly high suggests that while affect may play some role, there may be other issues related to knowledge, motivation, and access that are even more pertinent.

There are several potential limitations to our study. First, the study had a moderate response rate of 43%. Second, many clinical variables, including family history of breast cancer in first-degree relative; and co-morbidities such as hypertension, diabetes, high cholesterol, myocardial infarction, and stroke were not measured. Though this was not part of the original needs assessment objectives, it was realized during the study that these variables would have been a useful addition. Further, the survey lacked questions related to breast cancer knowledge and thus we cannot differentiate between those survivors who were unwilling and those who lacked the knowledge to engage in a healthy lifestyle. The difference between these two groups would be useful for guiding breast cancer survivors to beneficial interventions that could improve their health and well-being. There was also no specific question asking survivors about their weight maintenance behaviors. Therefore, we had to categorize their body mass index (BMI) with the adult designations for underweight, normal, overweight, and obese. Since the survey itself was grounded in health theory, it excluded a food frequency questionnaire that would have provided more substantive data regarding recent dietary behavior. Future research combining theory and clinical relevance should incorporate a more thorough assessment of diet and exercise behaviors. Further, "moderate physical activity" was undefined and was likely interpreted differently by survivors.

Conclusion

The lack of a strong, positive correlation between the perceived benefits of healthy eating and exercise in reducing the risk of breast cancer recurrence and self-reported diet and exercise behaviors in our breast cancer survivor population demonstrates the need for innovative approaches to intervene and improve their health and well-being. Thus, many survivors may be either unaware of the effects of their lifestyle, or unable or unwilling to adopt a healthy lifestyle even if they are aware of its benefits.

The delivery of evidence-based guidelines to survivors may be effective at promoting adherence to treatment plans and recommended lifestyle changes.³⁷



Specifically, patients who discussed the IOM guidelines with their physicians were more likely to engage in a healthy lifestyle compared to those who did not discuss these guidelines.³⁷ The more physicians can be involved in the treatment process, the greater the trust survivors will have in them and the care they provide.^{49,50}

The results of this study may be useful in the development of more thorough, future research, and the development of survivorship programs to help breast cancer survivors initiate and maintain healthy behaviors. Breast cancer interventions need to be provided for all stages and clear, concise education is needed regarding diet and physical activity. In the rural and underserved urban, resource poor areas within our region, access to healthy foods, provision of safe environments for physical activity, and social support must be integrated and encouraged among survivors and their friends, families, and others. Innovative interventions that could bring cooking classes and cookbook creation to survivors through non-profit organizations, schools, places of worship, and other community groups could be both feasible and sustainable means to improve breast cancer survivors' quality of life now and for many years in the future.

Disclosure

This manuscript has been read and approved by all authors. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The authors and peer reviewers of this paper report no conflicts of interest. The authors confirm that they have permission to reproduce any copyrighted material.

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