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Hot flashes in breast cancer survivors: Frequency, severity and impact

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Abstract

Purposes—To (1) determine the frequency and severity of hot flashes, (2) examine the associations between hot flash frequency and severity and quality of life, and (3) identify the predictors of hot flash activity in breast cancer survivors.

Methods—The study used a cross-sectional design and mailed survey of 253 breast cancer survivors recruited from a cancer wellness clinic. Participants provided information regarding cancer history, hot flashes, pain intensity, sleep problems, physical functioning, and psychological functioning.

Results—About half of the survivors reported at least one hot flash in the past 24 h (45%) or past week (52%). The average frequency of hot flashes was 1.9 in the past 24 h and 1.8 in the past

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Conflict of interest statement

The authors declare no conflict of interest related to this study.

Ethical approval

The procedures of this study were approved by the University of Washington Internal Review Board Committee.

week. Hot flash severity was usually mild or asymptomatic. However, participants with hot flashes reported significantly more sleep problems and higher pain severity than those reporting no hot flashes. Moreover, the severity of hot flashes was associated with more sleep problems, higher pain severity, and more psychological dysfunction. History of hormonal suppression therapy and younger age predicted hot flash activity in the study sample.

Conclusions—In breast cancer survivors, hot flashes are common and are associated with unpleasant symptoms and poor quality of life. Research is needed to determine if treatments that reduce the frequency and severity of hot flashes in breast cancer survivors also result in improvements in symptoms such as sleep problems, pain, and psychological dysfunction.

Keywords

Breast cancer survivors; Menopause; Hot flashes; Sleep dysfunction; Psychological functioning; Physical functioning

Introduction

Hot flashes are a common problem in breast cancer survivors. Six times as many breast cancer survivors experience hot flashes compared to age-matched controls [1]. In the breast cancer survivor population, hot flashes are reported as one of the most prevalent and bothersome vasomotor symptoms [2,3]. Furthermore, breast cancer survivors report work performance loss due to hot flashes [4,5].

Recent research regarding hot flashes in breast cancer survivors focuses on potential treatments and management options. Evidence regarding the prevalence, frequency, severity of hot flashes, and the correlates of quality of life disturbances is limited. Previous studies have shown that the majority of postmenopausal women report hot flashes as mild (29%), moderate (37%), and severe (34%) [3]. Among young breast cancer survivors (aged 40 years or younger), 46% reported hot flashes [6].

However, limited studies examine hot flashes and menopausal symptoms in breast cancer survivors in wider age range. Further knowledge would provide useful information to providers regarding treatment. Moreover, survivors with hot flashes were found to have significantly greater interference with daily activities, overall quality of life, sleep, concentration, mood, and sexuality than the health controls [7]. Research also indicates that several factors, such as quality of life, poor or disrupted sleep [8,9], could be associated with hot flashes. Hot flashes also have been associated with fatigue, worse physical health and pain [10–12]. However, to our knowledge, no studies have yet evaluated the association between hot flash severity and psychological functioning.

Thus, this study aims to address these knowledge gaps by (1) investigating the frequency and severity of hot flashes, (2) examining the associations between hot flash frequency and sleep problems, pain, psychological functioning and physical functioning, and (3) identifying the predictors of hot flash activity in breast cancer survivors.

Methods

Participants

Participants were women with a history of breast cancer being seen in a cancer care follow-up clinic (the Seattle Cancer Care Alliance Women's Wellness Follow-up Clinic). The clinic sees patients who have completed primary treatment (including surgery, if indicated; they could be still receiving adjuvant hormone therapy) and are disease-free. One paper, focusing on the frequency, severity and impact of pain in this population has already been published [10]. Eligible participants must: (1) have completed primary treatment; (2) be disease-free; (3) be at least 18 years old; and (4) be able to read and write in English.

Measures

Hot flashes and its impact were assessed by paper-and-pencil questionnaires.

Demographic characteristics and cancer history

Participants provided information about their sex, age, race/ethnicity, educational level, and marital and employment status. Information was also elicited about participants' cancer history, including the initial approximate date of breast cancer diagnosis, time since breast cancer diagnosis, type of other cancer diagnosis, and type of cancer treatments (including surgery, radiation therapy, chemotherapy, and hormonal suppression therapy).

Hot flashes activity and severity

We assessed the severity and frequency of hot flash activity using questions from a self-report measure of hot flash activity and severity used in previous studies of hot flashes in cancer survivors [13]. Fig. 1 presents the definitions of hot flash severity (none, mild, moderate, severe, and very severe) and questions used. We computed two global weighted measures of hot flash severity; one for the past 24 h and one for the past week. The 24-h hot flash severity measure was computed by summing: (1) mild hot flashes reported in the previous 24 h X 1; (2) moderate hot flashes reported in the previous 24 h X 2; (3) severe hot flashes reported in the previous 24 h X 3; and (4) very severe hot flashes reported in the previous 24 h X 4 [19]. The past week hot flash severity measure was computed by multiplying the number of reported hot flashes during the past week by the reported average severity of those hot flashes [19]. We also computed a dichotomous measure representing the "presence" of hot flash activity.

Pain intensity

Two 0-10 numerical ratings scales (NRS) were used to assess average and worst pain intensity over the past week (with "0" meaning "*No pain*" and "10" meaning "*Pain as bad as could be*") [14]. NRS of pain intensity have demonstrated excellent validity via their strong associations with measures of pain intensity [15] and good reliability via good test-retest stability over a two-day period (e.g., $r = 0.78$) [16].

Sleep quality

Sleep quality was assessed using the 6-item Sleep Problem Index-I (SPI-I) [17]. The 12-items of the SPI-I assess overall sleep quality and sleep problem domains. The SPI-I scale score is transformed to a 0 to 100 scale, with higher scores reflecting more sleep problems [17]. The SPI-I shown good reliability (Cronbach's $\alpha = 0.78$) in a large normative sample [17]. In our sample, the internal consistency of the SPI-I items were also good (Cronbach's $\alpha = 0.79$).

Psychological functioning

The five-item SF-36 Mental Health scale (SF-36 MH) [18] was used to assess psychological functioning. The SF-36 MH scale has been used widely in studies of breast cancer survivors [19,20]. Also, the SF-36 MH scale has been shown to have high internal consistency, high test-retest stability, and good criterion validity which the MH was associated with other measures of mental health [18]. The MH five items are transformed to a 0 to 100 scale, with higher scores demonstrating better psychological functioning. In our sample, the internal consistency reliability of the SF-36 MH items was excellent (Cronbach's $\alpha = 0.85$).

Physical functioning

The 10-item SF-36 Physical Functioning scale (SF-36 PF; 18) was used to assess the physical functioning. The SF-36 PF is used widely in research for breast cancer survivors [19,20]. The SF-36 PF scale has also demonstrated good internal consistency and test-retest stability [24]. The SF-36 PF scale has been shown good criterion validity through its associations with physical health, general health and global quality of life [18]. The 10 PF items are transformed to a 0 to 100 scale, with higher scores demonstrating better physical functioning. In our sample, the internal consistency reliability of the SF-36 PF items was excellent (Cronbach's $\alpha = 0.91$).

Procedures

Four hundred and eighty-seven invitations and consent materials were sent to potential participants who were on the active patient list of the Wellness Follow-up Clinic. Three invited potential participants were deceased. In addition, five potential participants indicated either by mail or telephone they did not have a history of cancer. One potential participant was unable to complete the survey because of leaving the country. An additional 36 potential participants refused to participate in the study.

Data analysis

We first computed descriptive statistics of the available demographic and cancer history variables. Then, we compared the means of the study criterion measures (average and worst pain intensity, sleep problems, psychological functioning, and physical functioning) between those who reported no versus at least one hot flash in the past 24 h and past week, using *t*-tests. We then compared the mean scores on the pain and functioning measures between participants who described their typical hot flash as mild, moderate, severe, and very severe, using one-way ANOVAs. Next, we computed correlation coefficients between (1) the 24-h and past week hot flash severity scores and (2) sleep problems, pain, psychological

functioning, and physical functioning. Spearman's Rho coefficients were used because of the skewed distribution of the hot flash frequency data. Then, we performed chi-square analyses to see if the presence of one or more hot flashes in the past 24 h and week was associated with type of treatment received and type of cancer, and *t*-tests to see if age or duration of cancer (i.e., time since diagnosis) were different between those with and without hot flashes, and correlation coefficients between age and duration of cancer and frequency of hot flashes. We also ran a binary logistic regression to examine the final model for associations with the hot flash activity.

Results

A total of 253 participants consented and returned the completed surveys, representing a response rate of 52%. The demographic characteristics of the sample are shown in Table 1.

Frequency and severity of hot flash activity

Table 2 lists the frequency and severity of hot flash activity. About half reported that they had experienced at least one hot flash in the past 24 h (114; 45%) or past week (132; 52%). The average frequency of hot flashes was 1.9 (SD, 3.37) in the past 24 h and 1.8 per day (SD, 3.06) in the past week. Among those who reported hot flashes in the past week, the average frequency was 3.5 per day (SD, 3.50). Most participants reported either no hot flashes (48%) or only mild hot flashes (33%) in the past week.

Associations between the hot flash activity, severity and patient functioning

The results of the *t*-tests indicated that those reporting at least some hot flash activity (in the past week) had significantly more sleep problems (Mean MOS score for the no hot flashes group = 24.2, Mean MOS score for the hot flash group = 31.5, $t(251) = 3.23$, $p < 0.01$) and higher worst pain severity (Mean BPI-worst score for the no hot flashes group = 1.2, Mean BPI-worst score for the hot flash group = 1.8, $t(251) = 2.18$, $p < 0.05$). Participants who reported at least some hot flash activity in the past 24 h also reported lower psychological functioning (Mean MHI score for the no hot flashes group = 79.5, Mean MHI score for the hot flash group = 74.0, $t(251) = -2.57$, $p < 0.05$).

The ANOVA comparing participants who described their typical hot flash in the past week as none, mild, moderate, and severe indicated significant difference in severity of sleep problems [$F(3, 249) = 5.94$, $p < 0.001$; Post-hoc: Moderate hot flashes > No hot flashes symptoms ($p < 0.001$, Bonferroni)] and psychological functioning [$F(3, 249) = 3.46$, $p < 0.05$; Post-hoc: Moderate hot flashes < No hot flashes symptoms ($p < 0.05$, Bonferroni); Moderate hot flashes < Mild hot flashes ($p < 0.05$, Bonferroni)], but not in physical functioning, worst pain or average pain intensity. Table 3 lists the means of the criterion scores associated with each hot flash severity level.

As shown in Table 4, the Spearman's Rho correlation coefficients (ρ) between (1) the weighted hot flash severity score in the 24 h and (2) the criterion measures showed that participants with higher 24-h hot flash severity report more sleep problems ($\rho = 0.25$, $p < 0.001$), higher worst pain ($\rho = 0.19$, $p < 0.01$) and higher average pain intensity ($\rho = 0.17$, $p < 0.01$), and lower psychological functioning ($\rho = -0.18$, $p < 0.01$). No significant

associations were found between the 24-h hot flash severity score and physical functioning. Findings regarding the past week hot flash score were similar with the 24-h score except for a non-significant correlation between the past week hot flash score and psychological functioning ($\rho = -0.12$, $p > 0.05$).

Prediction of hot flash activity

The results show that reporting a history of hormonal suppression therapy was significantly associated with hot flash activity in the past week ($\chi^2 = 6.91$, $p < 0.01$), and also in the past 24 h ($\chi^2 = 6.08$, $p < 0.05$). Significant mean differences in the hot flash activity were also found for both age and time since cancer diagnosis. Specifically, the participants in the no hot flashes group in the past week were older (mean age 60.9 years) than participants who reported having had at least one hot flash in the past week (mean age 56.8 years; $t(228) = -3.13$, $p < 0.01$). Similarly participants in the no hot flashes group in the past 24 h were older (60.3 years) than participants who reported having at least one hot flash in the past 24 h (56.8 years, $t(251) = -2.66$, $p < 0.01$). Also, participants who reported having at least one hot flash in the past week or past 24 h reported a longer duration since cancer diagnosis (for both groups, 10.1 years) than those who reported no hot flashes in the past week or 24 h (8.7 and 8.6 years, respectively, $t(251) = 2.00$ and 2.05 , respectively, both $ps < 0.05$). Other therapies (surgery, radiation therapy, and chemotherapy) and other cancer diagnosis (ovarian, cervical, and uterine cancer) were not significantly associated with hot flash activity.

The results of logistic regression show that younger age ($OR = 0.97$, $p < 0.01$, for the past 24 h; $OR = 0.96$, $p < 0.01$, for the past week) and having hormonal suppression therapy ($OR = 1.91$, $p < 0.05$, for the past 24 h; $OR = 2.02$, $p < 0.01$, for the past week) are significant independent predictors of reporting at least one hot flash in the past week. However, time since cancer diagnosis was not significantly associated with hot flash activity in the multivariate analyses.

Discussion

This study provided new information regarding the frequency, severity, impact and predictors of hot flashes among breast cancer survivors. We showed that (1) half of breast cancer survivors in our sample experienced hot flashes at daily and or weekly intervals, (2) hot flashes were associated with sleep problems, pain and lower levels of psychological functioning and (3) predictors for hot flash activity in breast cancer survivors included (a) a history of hormone suppression and (b) younger age. To the best of our knowledge, this was the first time that the association between hot flashes and pain has been examined and reported. Our finding that hot flashes within the past 24 h affects psychological functioning has also not been previously reported.

Of the patients who experienced hot flashes over the past 24 h or week, 34% and 81% found the hot flashes asymptomatic or mild, respectively. Less than 5% of patients reported their hot flashes to be severe or very severe, contrary to previously studies which reported a rate of roughly 30% of hot flashes to be severe [3,21]. Such discrepancy may come from the older age or longer time since diagnosis in our sample. Hot flashes are thought to be the result of quick hormone changes in perimenopause and would gradually improve as women

age into the early post-menopause phase [22]. Thus, older women are more likely to be in the post-menopause phase, and to report fewer severe hot flashes. Similarly, women who have had cancer for longer periods would also be expected to report fewer severe hot flashes than women who have recently been diagnosed with and treated for cancer, and the relatively low rate of severe hot flashes in our sample may be due, at least in part, to our sample having a longer time since their original diagnosis than the samples from other research studies. In addition, the difference could reflect the benefit of targeted therapy aimed at hot flashes that the survivors have received in the Wellness Clinic, which is a model for a Breast Cancer Survivorship Clinic. Importantly, although the findings suggest that while hot flashes may decrease in severity over time, they do persist as a symptom in some women. This highlights the need for continued therapy or symptom management for breast cancer survivors with hot flashes. However, for the approximately 5% of women who experience severe or very severe hot flashes in our sample, hot flashes clearly continue to be a significant issue.

The 45-52% patients with hot flashes (i.e., at least some hot flash activity either in the past 24 h or past week) reported significantly more sleep problems and worse pain severity than the women without hot flashes. Our findings are consistent with those of others who have found that hot flashes are associated with poor sleep [8,11,23]. In addition, the specific subgroup of patients who reported at least some hot flash activity in the past 24 h also reported more psychological dysfunction. Recent evidence reported by our group (and using the same sample of individuals who participated in the current study) suggests that pain is an underreported symptom for breast cancer survivors [10]. Hot flashes may negatively impact these quality of life and social factors such as psychological functioning through their interference with sleep and resulting fatigue.

Predictors of hot flash activity were hormonal suppression therapy and younger age. Hormonal suppression therapy carries with it the known side effect of hot flashes and previous findings showed endocrine treatments induced increased incidence and severity of hot flashes in younger women [24,25]. In both populations of breast cancer survivors, young women and those on adjuvant hormone therapy/suppression, hot flash activity may contribute to the decreased rates of compliance recently reported [26].

The results of this study underscore the need for monitoring and treating of hot flashes. Pharmacologic therapies [2,27] as well as multi-disciplinary approaches that include acupuncture [28,29], weight loss [30], yoga regimens [27,31] should be considered. It is important to determine the extent to which effective treatments for hot flashes also improve associated symptoms and problems, such as sleep difficulties, pain and psychological dysfunction.

Some limitations should be considered when interpreting the results. First, the data were self-reported. Thus, some of the relationships found between the study variables may share method variance. However, hot flash activity showed different levels of associations to the different criterion domains indicates that shared method variance does not explain all of the significant relationships. The measure assessing hot flash activity in this study has been validated as a diary self-report measure [13], but this previously validated diary measure was

used as a single time point recall measure in this study. The reliability and validity of these questions as recall measures have not yet been demonstrated. However, data using other very similar recall questions of hot flash activity have established validity [32]. Second, only about 50% of questionnaires sent were returned. In similar mail survey studies, response rates are even lower: 15%–46% [7,33]. However, we cannot be certain that the rates of hot flashes reported by our sample necessarily reflect that of the population of breast cancer survivors. Either way, though, all of the available evidence indicates that hot flashes continue to be a significant problem for many breast cancer survivors. A third limitation is that our sample skewed some towards the upper middle class, and the majority of the sample was Caucasian. It would be important to also examine the hot flash experience in women in other demographic groups. Finally, it is important to emphasize that the data are cross-sectional, restraining us from making causal conclusions regarding the associations found.

Despite these limitations, the findings provide important new information regarding the impact of hot flashes on the lives of women with a history of breast cancer. The biology of hot flashes relates to the changes in hormone levels which interfere with the body's ability to regulate temperature. The hormonal effects and manipulation involved in the primary treatment for breast cancer contribute the increased frequency of hot flashes in breast cancer survivors. With the increasing number of breast cancer survivors and more personalized therapies including prescribed endocrine treatment, good symptom knowledge and management is important to ensuring patient compliance. Future research is needed to determine if treatments that effectively decrease hot flashes influence key quality of life domains in breast cancer survivors.

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HOT FLASHES ACTIVITY

Before you answer the questions below about hot flashes, please refer to these examples of hot flashes that have been given by cancer survivors in previous studies when describing their hot flash severity. One or more of these descriptions may help to categorize your hot flash as mild, moderate, severe, or very severe.

- Mild:** Duration: Lasting less than 5 minutes
Physical symptoms: Warmth, felt uncomfortable, red face
Emotional symptoms: Not expected
Action needed: Usually no action is needed
- Moderate:** Duration: Lasting up to 15 minutes
Physical symptoms: Head, neck, ears, or whole body felt warm; tense, tight muscles; clammy (wet skin); a change in heart rate or rhythm (heart speeds up to changes beat); some sweating; dry mouth
Emotional symptoms: Felt irritated, felt agitated (restless), felt as though energy was drained out, felt embarrassed when having a hot flash in front of others, felt tired, felt annoyed
Action needed: Needed to use a fan, awakened sometimes at night, needed to uncover, took off layers of clothing, drank water, opened the windows even when cold outside, wore lighter clothing
- Severe:** Duration: Lasting up to 20 minutes
Physical symptoms: Warmth, sometimes described as a raging furnace or burning up; a change in heart rate or rhythm (heart speeds up or changes beat); felt faint; headache; severe sweating; weakness, a pricking, stinging sensation over skin; chest heaviness
Emotional symptoms: Embarrassment, anxiety, feelings of having a panic attack
Action needed: Needed to stop what was being done at that time, usually awakened at night and removed covers, needed to remove clothes, opened windows, kept the house a cooler temperature, frequently used fans
- Very severe:** Duration: Lasting up to 45 minutes
Physical symptoms: Boiling heat, rolling sweat, difficulty breathing, felt faint, felt dizzy, feet and/or legs cramping; a change in heart rate or rhythm (heart speed up to changes beat); felt slightly sick to stomach
Emotional symptoms: Felt distressed, had the urge to escape, had difficulty functioning
Action needed: Awakened frequently, at night, needed to change sheets and pajamas, needed to take a cold shower, needed to hold ice on skin

The next two questions ask about hot flash activity in the last 24 hours:

1. In the LAST DAY (past 24 hours), how many hot flashes did you have that were:

Hot flash type	Number in the past 24 hours
Mild.....	_____
Moderate....	_____
Severe.....	_____
Very severe...	_____

2. TOTAL number of hot flashes you have had (of all types) in the past 24 hours? _____

The next two questions ask about hot flash activity in the last week:

3. In the past 7 days, how many hot flashes would you say you had per day, on average?
About _____ hot flashes per day, on average.
4. Which word best describes your typical hot flash during the past 7 days?
- ☐ 1) Mild
☐ 2) Moderate
☐ 3) Severe
☐ 4) Very severe

Fig. 1.
Hot flash activity questions used in this study.

Table 1

Demographic characteristics of all participants ($N = 253$).

Variables	<i>n</i>	%	Mean	<i>SD</i>	Range
Age			58.7	10.61	29–91
~44 years	18	7.1			
45–65 years	169	66.8			
66 years ~	66	26.1			
Time since diagnosis			9.4	5.64	1–39
Treatment type					
Surgery	247	97.6			
Radiation therapy	183	72.3			
Chemotherapy	146	57.7			
Hormonal supplement therapy	103	40.7			
Additional cancer diagnosis					
Ovarian cancer	1	0.4			
Cervical cancer	3	1.2			
Uterine cancer	1	0.4			
Other cancer	32	12.6			
Educational level					
Had some colleges	66	26.1			
4-year college degree	84	33.2			
Graduate or professional school	83	32.8			
Employee status					
Full time	93	36.8			
Part-time	38	15.0			
Retired	93	36.8			

Table 2Frequency and severity of hot flash activity ($N=253$).

	<i>n</i> (%)	Mean (<i>SD</i>)	Range
Presence of hot flashes			
Past 24 h	114 (45%)		
Past week	132 (52%)		
Number of hot flashes per day			
Past 24 h		1.9 (3.37)	0–24
Past week		1.8 (3.06)	0–20
Severity of hot flash (past 24 h)			
Mild	87 (34%)		
Moderate	55 (22%)		
Severe	12 (5%)		
Very severe	1 (0.4%)		
Severity of hot flash (past week)			
Mild	84 (33%)		
Moderate	42 (17%)		
Severe	6 (2%)		
Very severe	0 (0%)		
Hot flash score (past 24 h)		2.9 (5.94)	0–48
Hot flash score (past week)		2.8 (5.78)	0–45

Comparison of mean differences in breast cancer survivor typical hot flash severity ($N = 253$).

Table 3

Criterion Measures	None		Mild		Moderate		Severe		<i>F</i>	<i>p</i>
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)		
Worst pain intensity	1.2 (2.30)	1.7 (2.12)	1.7 (2.12)	2.0 (2.24)	3.0 (4.29)	2.29	0.08			
Average pain intensity	0.9 (1.82)	1.1 (1.49)	1.3 (1.55)	2.0 (2.90)	5.94**	0.26				
Sleep problems	24.2 (17.70)	28.5 (17.24)	36.4 (17.60)	40.0 (23.85)	72.7 (12.75)	3.46*	0.02			
Psychological functioning	78.8 (16.59)	78.4 (16.45)	69.6 (19.26)	83.0 (20.33)	67.5 (25.25)	1.69	0.17			
Physical functioning	86.0 (20.27)	84.6 (20.33)	83.0 (20.33)	83.0 (20.33)	67.5 (25.25)	1.69	0.17			

* $p < 0.05$.

** $p < 0.001$.

Table 4

Correlation between hot flash score and criterion measures (Spearman's rho).

	Hot flash score	
	Past 24 h	Past week
Worst pain intensity	0.19 ^{**}	0.20 ^{**}
Average pain intensity	0.17 ^{**}	0.18 ^{**}
Sleep problems	0.25 ^{***}	0.24 ^{***}
Psychological functioning	-0.18 ^{**}	-0.12
Physical functioning	-0.06	-0.09

*
 $p < 0.05$,**
 $p < 0.01$,***
 $p < 0.001$.