Prospective Assessment of Fatigue and Health Status in Greek Patients With Breast Cancer Undergoing Adjuvant Radiotherapy

Maria Lavdaniti, RN, MSc, PhD, Elisabeth Patiraki, RN, PhD, Urania Dafni, PhD, Maria Katapodi, RN, MSc, PhD, Elizabeth Papathanasoglou, RN, MSc, PhD, and Anastasia Sotiropoulou, MD, PhD

Purpose/Objectives: To describe fatigue in women with breast cancer undergoing radiotherapy and to explore the impact of fatigue on their health status.

Design: Prospective, descriptive, repeated measures.

Setting: A major oncology center, Saint Savvas Cancer Hospital, in Athens, Greece.

Sample: Consecutive sample of 106 women (mean age = 55 ± 12), with histologically confirmed diagnosis for stage I or II breast cancer who were receiving adjuvant radiotherapy for approximately six weeks.

Methods: Data were collected with the Revised Piper Fatigue Scale (PFS) and the Short Form-36 (SF-36) Health Survey Scale in the first two days of radiotherapy (T_0), during the third week (T_1), and during the last week of treatment (T_2).

Main Research Variables: Fatigue, health status.

Findings: Across-subjects analysis revealed that fatigue increased during radiotherapy in patients with breast cancer regardless of stage, type of surgery, or whether they received chemotherapy ($p < 0.05$). Between-subject analysis revealed that no differences existed in the PFS between different groups (chemotherapy versus no chemotherapy, breast conservation versus mastectomy, stage I versus stage II) at each measurement point. A negative correlation was found between the subscales of the PFS and all of the subscales of the SF-36.

Conclusions: Fatigue intensity increased significantly during the course of radiotherapy, and patients experienced a significant deterioration in their overall health status.

Implications for Nursing: Findings contribute to the growing body of evidence regarding fatigue and its impact on health status in Greek patients with breast cancer and provide insights for effective nursing assessment, patient education, and symptom management.

Key Points . . .

- Radiotherapy is an independent factor that increases fatigue in patients with breast cancer receiving adjuvant treatment.
- Radiotherapy-induced fatigue significantly compromises the overall health status of patients with breast cancer.
- Fatigue in patients with cancer is a universal phenomenon, and research can focus on identifying patterns of treatment-related fatigue.
- Similar to nurses in other countries, Greek nurses should assess fatigue and implement appropriate interventions to help patients with symptom management.

Fatigue is the most prevalent symptom in patients with cancer (Graydon, Bubela, Irvine, & Vincent, 1995; Mock, 2003; Winningham et al., 1994), affecting 70%–95% of patients receiving chemotherapy, radiation therapy, or biotherapy (Jacobsen et al., 1999; Mock). It remains a disruptive symptom in 17%–40% of disease-free cancer survivors (Bower et al., 2000; Broeckel, Jacobsen, Horton, Balducci, & Lyman, 1998; Mock) and affects 85%–100% of patients in palliative care (Mock). Fatigue interferes with usual functioning and can disturb mood, concentration, perception, capacity to work, compliance with medical treatment, and the ability to perform usual daily activities (Irvine, Vincent, Graydon, Bubela, & Thompson, 1994; Mock).

More than 200,000 women will be diagnosed with breast cancer in 2006 in the United States, and although advances in diagnosis and treatment have reduced mortality rates, the disease remains the second leading cause of cancer deaths among women (American Cancer Society, 2006). In Greece, approximately 1,500 women are newly diagnosed with breast cancer every year, and an estimated 28% of annual female mortality is attributed to cancer, with breast cancer being one of the primary causes (Tountas, 2001).

Treatment protocols used in Greek patients with breast cancer are similar to those used in the United States. Radiotherapy is

Maria Lavdaniti, RN, MSc, PhD, is an oncology nurse specialist at Agioi Anargiroi Cancer Hospital in Athens, Greece; Elisabeth Patiraki, RN, PhD, is an assistant professor, and Urania Dafni, PhD, is an associate professor of statistics, both in the Faculty of Nursing at National and Kapodistrian University of Athens; Maria Katapodi, RN, MSc, PhD, is an assistant professor in the School of Nursing at the University of Michigan in Ann Arbor; Elizabeth Papathanasoglou, RN, MSc, PhD, is an assistant professor in the Faculty of Nursing at National and Kapodistrian University of Athens; and Anastasia Sotiropoulou, MD, PhD, is the director of the Second Radiotherapy Department at Saint Savvas Cancer Hospital in Athens.
(Submitted May 2005. Accepted for publication May 30, 2005.)

Digital Object Identifier: 10.1188/06.ONF.603-610

indicated either as a treatment or palliative care. Localized breast cancer treatment consists of breast-conserving surgery with a course of external-beam radiation therapy. Women at highest risk for breast cancer recurrence may be treated aggressively with high-dose chemotherapy and total body irradiation followed by autologous bone marrow transplant or peripheral blood stem transplant. Radiotherapy is palliative in cases of local recurrences or metastases (Michaelidis, 1999).

Much about fatigue has been learned from studies conducted mainly in the United States and western European countries. However, evidence suggests that culture affects patient responses to symptoms and the meaning attached to them, personal expectations for health, and health-seeking behaviors (King et al., 1997; Padilla & Kagawa-Singer, 1998). Cultural and contextual variations affect perception of fatigue (Chan & Molassiotis, 2001). Greek culture is more focused on collectivism than other Western countries (Triandis, 1990). Therefore, generalizing findings of cancer-related fatigue to Greek populations might not be appropriate, presumably because of cultural variations that might affect reporting of symptoms. Although interest in symptom management is increasing among Greek oncology nurses, to the authors' knowledge, no study has assessed fatigue in Greek patients with breast cancer during the active course of treatment. Therefore, the aims of this study were to describe fatigue in Greek patients with breast cancer receiving adjuvant radiotherapy during a six-week period and to explore the effect of fatigue on patients' health status.

Literature Review

Fatigue is a well-documented symptom in patients with breast cancer who are receiving chemotherapy (Berger & Higginbotham, 2000; Bower et al., 2000; Jacobsen et al., 1999; Woo, Dibble, Piper, Keating, & Weiss, 1998). Studies assessing radiation-induced fatigue in patients with different types of cancer have reported that fatigue increased during the course of radiation therapy (Graydon et al., 1995; Irvine, Vincent, Graydon, & Bubela, 1998; Smets et al., 1998). Studies that assessed radiation-induced fatigue exclusively in patients with breast cancer have suggested that fatigue reaches a maximum severity point prior to the completion of radiotherapy (Geinitz et al., 2001; Greenberg, Sawicka, Eisenthal, & Ross, 1992; Irvine et al., 1998). One study suggested that fatigue reached a plateau by the second week of treatment (Irvine et al., 1998), whereas others reported that fatigue reached a plateau by the fourth week of treatment (Geinitz et al.; Greenberg et al.). Possible explanations include differences among patients' characteristics, radiation treatments, and the scales used to assess fatigue. The mean duration of radiation treatment varied from four to five weeks (Geinitz et al.; Irvine et al., 1998) or six to nine weeks (Greenberg et al.).

However, studies that assessed radiation-induced fatigue had small samples consisting of 15–76 patients and did not evaluate possible confounders such as type of surgery, stage of disease, and whether patients received adjuvant chemotherapy (Geinitz et al., 2001; Greenberg et al., 1992; Irvine et al., 1998). Some studies used nonspecific scales for measuring fatigue, such as the Pearson-Byars Feeling Checklist (Greenberg et al.; Irvine et al., 1998), a visual analog scale (Geinitz et al.; Greenberg et al.), and the Profile of Mood States (Greenberg et al.). Only one study assessed the symptom with the Fatigue Assessment Questionnaire, which was developed specifically to assess fatigue (Geinitz et al.).

Several studies have documented that patients with cancer experience problems in maintaining their functional performance and suggested a relationship between fatigue and functional status (Ferrell, Grant, Funk, Otis-Green, & Garcia, 1998; Irvine et al., 1994), daily living (Smets et al., 1998), and quality of life (Mock et al., 2001). In patients with breast cancer, fatigue had a negative effect on overall quality of life (Bower et al., 2000; Broeckel et al., 1998) and functional status (Graydon, 1994), and it inhibited their self-care activities (Longman, Braden, & Mishel, 1997).

Fewer studies have examined the correlation of fatigue and functional status in patients with breast cancer during the active course of radiotherapy. Irvine et al. (1998) reported that patients experienced a significant decrease in functional status from baseline toward the end of radiation treatment. Wengstrom, Haggmark, Strander, and Forsberg (2000) reported that physical functioning decreased during the course of treatment and reached a nadir toward the end. However, the previously mentioned studies assessed health status with scales intended to measure quality of life or daily living and other nonspecific scales. The relationship between fatigue and health status during radiotherapy has not been examined systematically.

Although the body of evidence is growing regarding radiotherapy-induced fatigue in patients with breast cancer, little is known about the phenomenon in Greek women with breast cancer. Despite an increasing interest in fatigue management among Greek oncology nurses, to the authors' knowledge, fatigue often is underestimated and not recognized as an important side effect of cancer treatment by many healthcare professionals. The current study described fatigue in Greek patients with breast cancer undergoing adjuvant radiotherapy during a period of approximately six weeks and correlated fatigue with health status in those women. Moreover, the study examined whether clinical characteristics, such as type of surgery, stage of disease, and whether women received adjuvant chemotherapy, have an effect on radiation-induced fatigue.

Conceptual Framework

The study was based on Piper's Integrated Fatigue Model (IFM) (Piper et al., 1998). The IFM stresses that fatigue is a multidimensional phenomenon, measures fatigue and its dimensions, and identifies risk factors (patterns) that are associated with the development of fatigue. Central ideas of the IFM are subjective (perceptual) and objective (physiologic, biochemical, and behavioral) indicators of fatigue. Selected components of the IFM were addressed in the current study, such as disease factors (breast cancer, stages I and II), treatment factors (chemotherapy, radiotherapy, surgery), and the subjective perception of fatigue. Health status was the selected factor under the physiologic perception of fatigue that was examined as a possible correlate with fatigue and its dimensions.

Methods

Design and Sample

The study used a prospective, descriptive, repeated-measures design. A consecutive sample of 106 patients with breast cancer undergoing radiotherapy for five to seven weeks on an outpa-

tient basis at Saint Savvas Cancer Hospital in Athens, Greece, were recruited. Saint Savvas is one of the largest tertiary care cancer centers providing treatment to patients from all over Greece. Patients were eligible to participate in the study if they had histologically confirmed stage I or stage II breast cancer, were receiving radiotherapy on an outpatient basis, were not receiving concomitant chemotherapy, and were mentally able to provide informed consent. Patients with chronic renal failure were excluded to eliminate fatigue cases caused by anemia. The daily radiotherapy dose was 1.8–2.0 Gy, and the cumulative radiation dose was 50 Gy, with boost dose ranging from 10–15 Gy. The chemotherapy protocol was an anthracycline-based regimen (5-fluorouracil, epirubicin, and cyclophosphamide).

Procedure

The Faculty of Nursing at the University of Athens and the Ethics Committee at Saint Savvas Cancer Hospital approved the study protocol. Data were collected at three points in time: at baseline (during the first two days of radiotherapy) (T_0), between the third and fourth week of radiotherapy (T_1), and during the final week of radiotherapy (T_2). The primary author identified patients with breast cancer undergoing radiotherapy. She approached women in the radiotherapy department while they were waiting for treatment. The study aims were explained, and women were asked whether they were willing to participate. After women were given the opportunity to ask questions about the study, those who agreed to participate provided verbal informed consent. Once patients agreed to participate, their medical files were reviewed to verify their eligibility to participate in the study. Upon verification of their eligibility, patients completed the survey questionnaire in a private room, which took approximately 20–30 minutes. A total of 127 women were invited and 106 agreed to participate in the study (83%). Reasons for refusal included lack of time, no interest in participating, tiredness, and feeling disinclined to talk more about their cancer diagnoses.

Instruments

Fatigue was measured with the **Revised Piper Fatigue Scale (PFS),** which consists of 22 items that measure four dimensions of subjective fatigue: behavioral/severity, affective meaning, sensory, and cognitive mood (Piper et al., 1998). Possible scores range from 0–220, with higher scores indicating higher levels of fatigue. The scores on all of the items in a particular subscale were added, and the sum was divided by the number of items in the particular subscale, providing a mean subscale score on the original 0–10 scale. The PFS was translated into Greek by the first and second authors and was translated back into English by an independent expert linguist who was not affiliated with the study. Tool reliability has been documented in patients with cancer (Piper et al.). In the study sample, Cronbach's alpha ranged from 0.90–0.94.

Health status was measured with the Short Form-36 (SF-36) Health Survey Scale (Ware & Sherbourne, 1992). The SF-36 contains eight subscales that measure health status in the following areas: physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, and mental health. Scores range from 0–100, with higher scores indicating better health status. The authors located a Greek version of the SF-36 from an unpublished dissertation (Sarris, 1999). Cronbach's alpha in the present sample ranged from 0.90–0.93. Evidence of content-related validity of both instruments was obtained from seven experienced oncology nurses and 10 patients with breast cancer undergoing radiotherapy (10% of the total sample).

Demographic characteristics (e.g., age, education, employment status, marital status) and clinical variables (e.g., type of surgery, treatment, stage of disease) were obtained from patients' medical records.

Data Analysis

The statistical software package SPSS® 10 (SPSS Inc., Chicago, IL) was used to analyze the data. Descriptive statistics were used for demographic characteristics. For data that were not normally distributed, nonparametric tests (Mann-Whitney U test, Friedman test, and Spearman correlation coefficient) were used. Friedman's repeated-measures analysis of variance on ranks was used to analyze the data for changes in total fatigue over time. Mann-Whitney U test was used to determine the differences between the groups at the same measurement point. Correlations were calculated using the Spearman correlation coefficient.

Results

Table 1 describes the characteristics of the 106 participants. All patients were Greek (Caucasian) with a mean age of 55 (± 12) years. Most (68%) were married, retired or employed inside the home (60%), and had a high school education or less (70%). The majority of patients (64%) had stage II disease. Most women had undergone breast-conserving surgery (83%) and received adjuvant chemotherapy (58%).

Table 1. Demographic and Disease Characteristics

Characteristic	n	%
Age (years)		
$\bar{X}$ (SD) = 55 (12)	–	–
Range = 29–78	–	–
Marital status		
Single	8	7
Married	72	68
Divorced	5	5
Widowed	21	20
Employment status		
Employed outside the home	42	40
Employed inside the home	34	32
Retired	30	28
Years of education		
0–6	38	36
7–9	5	5
10–12	31	29
13–16	19	18
> 16	13	12
Stage of cancer		
I	38	36
II	68	64
Surgery before radiation		
Breast conserving	88	83
Mastectomy	18	17
Chemotherapy before radiation		
Yes	61	58
No	45	42

N = 106

Table 2. Change Over Time in Revised Piper Fatigue Scale Scores

Sample Characteristics	Baseline	Time 1	Time 2	p[a]
Mean scores of total sample	1.96 ± 1.90	2.60 ± 2.00	2.90 ± 1.80	< 0.001
Stage of disease				
I	1.75 ± 1.71	2.16 ± 1.94	2.59 ± 1.76	0.005
II	2.07 ± 2.02	2.87 ± 1.99	3.10 ± 1.88	< 0.001
Chemotherapy				
Yes	2.20 ± 2.13	2.88 ± 2.10	2.93 ± 1.92	0.002
No	1.64 ± 1.50	2.32 ± 1.89	3.01 ± 1.79	< 0.001
Type of surgery				
Breast conserving	1.93 ± 1.87	2.61 ± 2.00	2.87 ± 1.80	< 0.001
Mastectomy	2.11 ± 2.08	2.76 ± 2.21	3.39 ± 2.12	0.006

[a] P values are for comparisons in baseline to time 2 measurement points.

Overall, patients experienced low levels of fatigue. The mean fatigue score was 1.96 (± 1.90) at baseline. The distribution of fatigue at baseline was skewed to the right, suggesting that although most patients were experiencing low levels of fatigue, some experienced high levels of the symptom. At baseline, 10 women scored 4–6 on the PFS and 4 women scored higher than 7. This means that approximately 13% of women in the study experienced moderate to high levels of fatigue at baseline. The mean fatigue scores for each subgroup of patients and at each measurement point are presented in Table 2.

Pattern of Fatigue Over Time

Across-subjects analysis for all 106 patients indicated that a statistically significant difference existed in fatigue scores among the three measurements points ($p < 0.001$). Across-subjects paired comparisons indicated significant differences in fatigue levels between T_0 and T_1 ($p < 0.001$), between T_1 and T_2 ($p = 0.002$), and between T_0 and T_2 ($p = 0.001$) (see Figure 1).

Fatigue increased during radiotherapy in group I (received no chemotherapy) ($p < 0.001$) as well as group II (had chemotherapy) ($p = 0.002$). These results are presented in Figure 2. Across-subjects paired comparisons in the no-chemotherapy group indicated that fatigue increased between T_0 and T_1 ($p = 0.001$) and between T_1 and T_2 ($p < 0.001$). In group II (chemotherapy), fatigue levels were higher in T_1 and T_2 versus T_0 ($p < 0.001$ and $p = 0.004$, respectively) but remained stable between T_1 and T_2 ($p = 0.606$). Moreover, between-subjects analysis indicated that no significant differences existed in fatigue levels between the two groups at any measurement point.

Fatigue increased during radiotherapy in the breast-conserving ($p = 0.001$) and mastectomy groups ($p = 0.006$). These results are presented in Figure 3. Across-subjects analysis indicated that fatigue increased during radiotherapy for the breast-conserving group at all time points, between T_0 and T_1 ($p < 0.001$), between T_1 and T_2 ($p = 0.017$), and between T_0 and T_2 ($p < 0.001$). For the mastectomy group, fatigue remained stable between T_0 and T_1 but increased between T_1 and T_2 ($p = 0.004$). Fatigue levels were higher between T_0 and T_2 ($p = 0.020$). However, between-subjects analysis indicated that no statistically significant difference existed between those two groups at any time point.

Finally, fatigue increased during radiotherapy for women with stage I ($p = 0.005$) and stage II ($p < 0.001$) disease (see Figure 4). Across-subjects analysis indicated that for women with stage I disease, fatigue remained stable between T_0 and T_1 ($p = 0.077$) and increased between T_1 and T_2 ($p = 0.010$). In women with stage II breast cancer, fatigue levels were higher in T_1 and T_2 versus T_0 ($p < 0.001$ and $p < 0.001$, respectively) but remained stable and elevated between T_1 and T_2 ($p = 0.055$). Between-subjects analysis indicated no significant differences between women with stage I disease and stage II groups at any time point. Fatigue reached a plateau for the chemotherapy group and for patients at stage II between the fourth week and the last week of radiotherapy.

Impact of Fatigue on Women's Overall Health Status

Overall, patients had good health status. The mean SF-36 score was 56.74 (± 13.55) for T_0, 56.87 (± 13.21) for T_1, and 55.83 (± 13.88) for T_2. The mean scores of the SF-36 subscales for the three measurements points are presented in Table 3.

To determine the impact of fatigue on patients' health status, a correlation analysis (Spearman correlation coefficient) was conducted. At T_0, a statistically significant negative correlation was observed among most of the subscales of PFS and most of

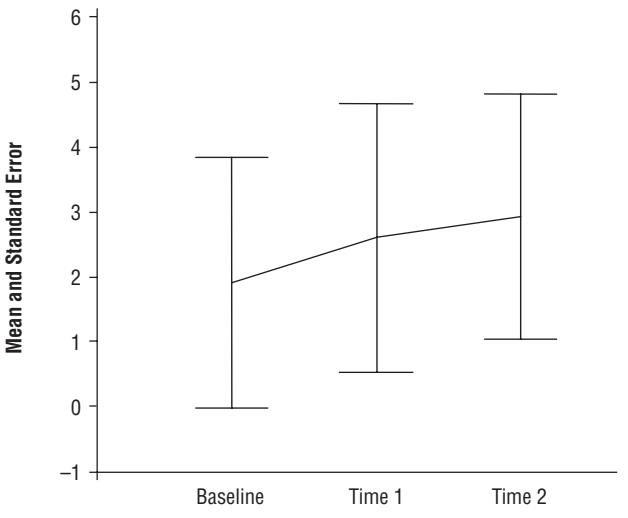

Figure 1. Mean and Standard Error of the Revised Piper Fatigue Scale in the Entire Sample

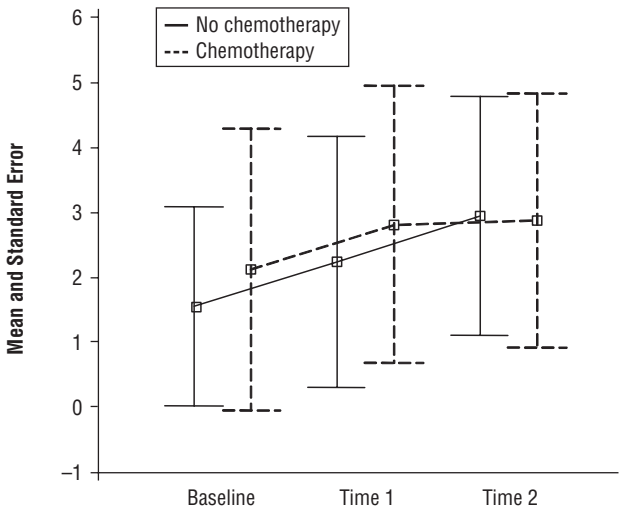

Figure 2. Mean and Standard Error of the Revised Piper Fatigue Scale in the Chemotherapy and No-Chemotherapy Groups

the subscales of the SF-36. At T_1 and T_2, statistically significant negative correlations were observed among all of the subscales of the PFS and all of the subscales of the SF-36. This means that as fatigue was increasing during the course of radiotherapy, the health status of the women in the sample was deteriorating. Table 4 describes all correlations among PFS subscales and SF-36 subscales at the three measurement times.

Discussion

The study assessed fatigue in Greek patients with breast cancer receiving adjuvant radiotherapy and the effect of fatigue on their health status over a period of six weeks. It contributes to the growing body of evidence regarding radiation-induced fatigue and provides an important foundation for Greek oncology nurses, because describing the phenomenon is a fundamental step toward appropriate interventions. Moreover, the study recruited a larger sample than earlier descriptive studies and systematically assessed some confounding variables, such as preceding chemotherapy treatment, type of surgery, and stage of disease.

Patients with breast cancer in the study sample generally experienced low levels of fatigue. This is consistent with other studies (Geinitz et al., 2001; Greenberg et al., 1992; Irvine et al., 1998) and a meta-analysis of five studies (Schwartz et al., 2000) reporting that radiation-induced fatigue gradually accumulated over the course of treatment. However, Donovan et al. (2004) examined fatigue in 134 patients with breast cancer and reported that although fatigue increased during radiotherapy, no significant increase resulted following the midtreatment point. In the present study, fatigue increased at all measurement points. Inconsistencies could be attributed to research design and sample characteristics. The present study did not assess time elapsed between chemotherapy and radiotherapy, whereas Donovan et al. reported a mean period of 31 days. Moreover, the latter study included more women with stage I disease and more women treated with lumpectomy. More descriptive work is needed that focuses on longitudinal assessment of the phenomenon and assesses confounding characteristics to identify the optimum timing for effective interventions.

Although levels of fatigue were generally low, the distribution of fatigue at baseline was skewed to the right, indicating that a small number of women were experiencing high levels of fatigue. A survey of approximately 2,000 breast cancer survivors in the United States reported that although most breast cancer survivors did not experience heightened levels of fatigue compared to the general female population, a subgroup of patients reported severe fatigue and compromised quality of life (Bower et al., 2000). Bower et al. used the mathematical middle point of the Rand Health Survey as a cutoff point; women who scored lower than that fall in the disability and limitations range of the scale. In the present study, approximately 13% experienced moderate to high levels of fatigue at baseline. Findings have significant clinical implications because approximately one in eight patients with breast cancer receiving radiotherapy experienced high levels of fatigue. Identifying those patients at an early stage is important so that appropriate interventions can be implemented.

The study also examined whether stage of disease, type of surgery, and prior chemotherapy influence the pattern of fatigue. Between-subjects analysis revealed that type of surgery, stage of disease, and receiving chemotherapy did not have a significant impact on fatigue levels at any point in time. However, the findings could be attributed to a small sample size that did not have enough power to detect any such differences. Different patterns of fatigue were found in the different groups of women. For patients pretreated with chemotherapy, fatigue increased from baseline to midtreatment, and it reached a plateau toward the end. This finding is consistent with other studies (Donovan et al., 2004; Wratten et al., 2004). For women who were not pretreated with chemotherapy, a significant increase existed in fatigue from midtreatment toward the end of radiotherapy. In light of the present data, the authors cannot reach any final conclusions regarding this finding.

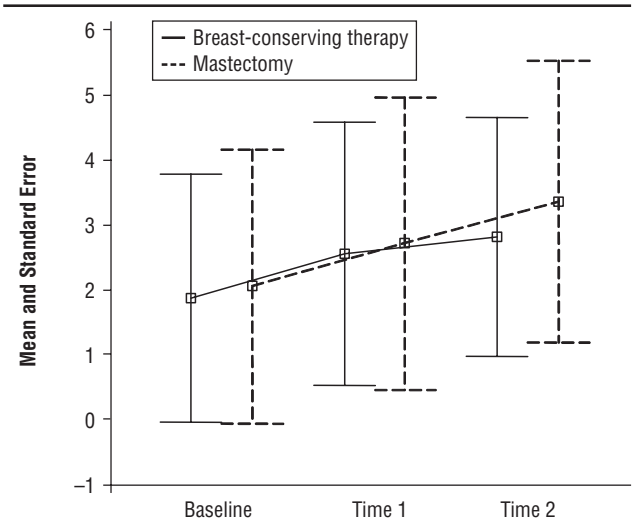

Figure 3. Mean and Standard Error of the Revised Piper Fatigue Scale in the Breast-Conserving Therapy and Mastectomy Groups

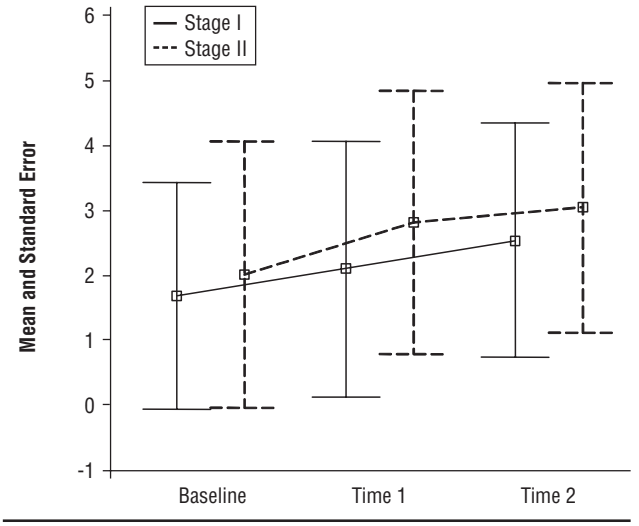

Figure 4. Mean and Standard Error of the Revised Piper Fatigue Scale in Patients With Stage I and II Disease

Women in the mastectomy group did not experience significantly higher fatigue compared to those receiving lumpectomy. This is consistent with suggestions that type of surgery did not correlate with fatigue levels in patients with breast cancer treated with chemotherapy (de Jong, Courtens, Abu-Saad, & Schouten, 2002; Jacobsen et al., 1999). It also could be attributed to the small number of women receiving mastectomy (n = 18) and to the fact that a mean time of five months elapsed between the surgery and the survey. Fatigue severity might be higher in the first three postoperative months, regardless of the type of surgery (Cimprich & Ronis, 2001). The present data suggest that the pattern of fatigue in the two groups was different. A significant increase in fatigue was found at the three measurement points for women who received breast-conserving surgery, whereas women treated with mastectomy experienced a significant increase in fatigue between the midtreatment point and toward the end of treatment. Future research with large sample sizes might better examine this issue.

Finally, consistent with other studies (de Jong et al., 2002; Jacobsen et al., 1999), being diagnosed with stage I or stage II disease did not influence fatigue at any measurement point. However, the pattern of fatigue was different for the two groups. Women with stage I disease experienced greater fatigue toward the end of treatment, and women with stage II disease experienced increased fatigue from baseline to midtreatment and reached a plateau toward the end of treatment. These findings do not allow any final conclusions regarding patterns of fatigue and the effect of clinical variables.

The second aim of the study was to examine the effect of fatigue on patients' health status. Negative correlations among subscales of the PFS and the SF-36 at baseline increased in intensity during the course of radiotherapy, suggesting that patients with breast cancer were experiencing the greatest disruption in their health status at the end of treatment. This is consistent with other studies (Donovan et al., 2004; Wengstrom et al., 2000). Finally, in the current sample of Greek patients with breast cancer, who were in generally good health, all of the subscales of the SF-36 correlated negatively with the subscales of PFS toward the midtreatment point and at the end of radiotherapy. A pilot study examining the influence of fatigue on the health status of patients with breast cancer also reported that correlates indicative of better health status were associated with later onset of fatigue, whereas correlates indicative of negative health were associated with earlier onset of fatigue (Berger & Higginbotham, 2000).

Limitations

Although the study recruited women from a single oncology hospital, the authors consider that this limitation is counteracted by the fact that the hospital receives patients from all areas of Greece. Further limitations are that the study did not assess whether fatigue persisted after the end of radiotherapy, a power analysis to assess the number of patients needed to detect significant differences in the sample was not conducted, and other factors that might have contributed to women's fatigue were not assessed (e.g., time elapsed between completion of chemotherapy and initiation of radiotherapy). Research on symptom clusters (Miaskowski, Dodd, & Lee, 2004) suggests that symptoms such as depression, menopausal status, and other biochemical factors might be contributing to fatigue levels observed in this study. Finally, researchers might be better able to compare cultural differences in perceived fatigue if data collection occurred in two or more settings from countries with different cultures.

Implications for Nursing

The current study's findings suggest that Greek patients with breast cancer undergoing adjuvant radiotherapy experience low levels of fatigue that increase toward the end of treatment and

Table 3. Change Over Time in Mean Short Form-36 Subscale Scores for the Three Measurement Times

Subscale	Baseline	Time 1	Time 2	p[a]
General health	68.34 ± 21.16	68.20 ± 20.49	66.83 ± 21.12	NS
Physical functioning	69.05 ± 21.94	68.34 ± 22.32	67.26 ± 22.53	NS
Physical role	41.03 ± 39.06	36.55 ± 37,67	34.19 ± 37.37	NS
Bodily pain	80.84 ± 23.38	84.15 ± 22.58	81.13 ± 23.95	NS
Vitality	58.09 ± 21.45	55.04 ± 19.83	51.28 ± 19.64	< 0.001
Social functioning	71.94 ± 30.20	74.80 ± 27.22	76.45 ± 27.62	NS
Emotional role	59.33 ± 37.74	64.39 ± 36.68	66.90 ± 35.89	NS
Mental health	57.18 ± 20.06	57.98 ± 18.44	57.63 ± 18.29	NS

[a] P values are for comparisons in baseline to time 2 measurements points.

NS—not significant

Table 4. Correlations Among Revised Piper Fatigue Subscales and Short Form-36 Subscales for the Three Measurement Times

	Revised Piper Fatigue Scale											
	Behavioral			Affective			Sensory			Cognitive or Mood		
Short Form-36	T_0	T_1	T_2	T_0	T_1	T_2	T_0	T_1	T_2	T_0	T_1	T_2
General health	−0.34**	−0.38**	−0.44**	−0.38**	−0.43**	−0.49**	−0.19	−0.39**	−0.43**	−0.34**	−0.51**	−0.55**
Physical functioning	−0.22*	−0.49**	−0.61**	−0.21*	−0.41**	−0.51**	−0.09	−0.33**	0.42**	−0.15	−0.26**	−0.26**
Physical role	−0.30**	−0.47**	−0.57**	−0.23*	−0.41**	−0.53**	−0.18	−0.35**	−0.39**	−0.19*	−0.25**	−0.28**
Bodily pain	−0.21*	−0.33**	−0.41**	−0.23**	−0.30**	−0.40**	−0.11	−0.26**	−0.34**	−0.54	−0.21*	−0.29**
Vitality	−0.52**	−0.69**	−0.73**	−0.51**	−0.64**	−0.73**	−0.47**	−0.62**	−0.61**	−0.48**	−0.55**	−0.58**
Social functioning	−0.19	−0.37**	−0.40**	−0.23*	−0.30**	0.31**	−0.28**	−0.27**	−0.16	0.36**	−0.43**	−0.33**
Emotional role	−0.23*	−0.23*	−0.42**	−0.27**	−0.26**	−0.41**	−0.15	−0.20**	−0.25**	−0.25**	−0.33**	−0.38**
Mental health	−0.35**	−0.32*	−0.48**	−0.39**	−0.36**	0.52**	−0.31**	−0.30**	−0.43**	−0.49**	−0.48**	−0.58**

*p < 0.05; **p < 0.01, two-tailed

T_0—baseline; T_1—time 1; T_2—time 2

compromise patients' health status. The possibility exists that, for a subgroup of those women, fatigue reached significant levels at the end of treatment, and the question remains as to whether it persisted after the end of treatment and for how long. Patients should be educated to report the symptom to the healthcare team. Routine assessment of fatigue will help patients to understand its pattern during the course of radiotherapy. Informing them that fatigue is an expected side effect of treatment and may increase toward the end of radiotherapy may help them plan their daily activities and encourage better coping strategies.

Nursing research has offered examples of symptom management interventions aiming to alleviate fatigue (Christopher & Morrow, 2004; Headley, Ownby, & John, 2004; Pickett et al., 2002). Results suggest that patients should maintain an optimum level of physical activity and initiate an exercise program if they are in active treatment (Mock, 2003). However, most of these suggestions and the effectiveness of exercise interventions are based on the samples in the United States. Although fatigue appears to be a universal phenomenon with similar patterns among patients with breast cancer from the United States, Greece, and other counties, such as Turkey (Can, Durna, & Aydiner, 2004), future research should examine whether exercise interventions that have proven effective in the United States are culturally acceptable and effective with Greek patients with breast cancer, because exercise is not a common activity for many European women.

Findings indicate that women's overall health status at the beginning of radiotherapy might have an effect on the onset, duration, and pattern of fatigue. The clinical implications are that oncology nurses should assess women's overall health status at the beginning of radiotherapy and be aware that comorbidities might accelerate the onset of fatigue. Nursing researchers should include health status as a significant variable that influences the optimum timing for implementing a symptom management intervention. Finally, although the present study does not provide many new findings that are relevant to women in the United States as noted in other studies conducted outside the United States (Yan & Sellick, 2004), it provides insights into the importance of health assessment and symptom management that aim to improve the quality of life of patients with breast cancer of various cultural backgrounds.

The authors acknowledge the women who so graciously consented to participate in this study; Saint Savvas Cancer Hospital Nursing Director V. Marmara, RN; and the directors of the radiotherapy departments where recruitment took place, K. Mperoukas, MD, and J. Katsilieris, MD.

Author Contact: Maria Lavdaniti, RN, MSc, PhD, can be reached at lavda@acn.gr, with copy to editor at ONFEditor@ons.org.

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