

Prevalence, Clinical Characteristics, and Risk Factors for Insomnia in the Context of Breast Cancer

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Study Objectives: To estimate the prevalence of insomnia, describe clinical characteristics of sleep difficulties, assess the influence of cancer on the insomnia course, and identify potential risk factors involved in the development of insomnia among women who had received radiotherapy for non metastatic breast cancer.

Design: A sample of 300 consecutive women who had been treated with radiotherapy for non metastatic breast cancer first completed an insomnia screening questionnaire. Participants who reported sleep difficulties were subsequently interviewed over the phone to evaluate further the nature, severity, duration, and course of their insomnia.

Setting: N/A

Patients or Participants: N/A

Interventions: N/A

Measurements and Results: Nineteen percent (n=56) of the participants met diagnostic criteria for an insomnia syndrome. In most cases (95%),

insomnia was chronic. The onset of insomnia followed the breast cancer diagnosis in 33% of the patients and 58% of the patients reported that cancer either caused or aggravated their sleep difficulties. Factors associated with an increased risk for insomnia were sick leave, unemployment, widowhood, lumpectomy, chemotherapy, and a less severe cancer stage at diagnosis. Among women with insomnia symptoms, the risk to meet diagnostic criteria for an insomnia syndrome was higher in those who were separated and had a university degree.

Conclusions: Insomnia is a prevalent and often chronic problem in breast cancer patients. Although it is not always a direct consequence of cancer, pre-existing sleep difficulties are often aggravated by cancer. It is therefore important to better screen breast cancer patients with insomnia and offer them an appropriate treatment.

Key words: Breast cancer; insomnia; sleep; prevalence; risk factors

INTRODUCTION

RECEIVING A DIAGNOSIS OF BREAST CANCER IS AN EXPERIENCE OFTEN ASSOCIATED WITH HIGH LEVELS OF PSYCHOLOGICAL DISTRESS. Psychological and psychophysiological disturbances that have received the most attention from psycho-oncology researchers include depression, anxiety, nausea and vomiting, and pain.¹⁻⁵ In contrast, insomnia has received very little attention in spite of the evidence suggesting that sleep difficulties are among the most frequent consequences of cancer.⁶

Studies conducted among heterogeneous samples of cancer patients suggest that between 31% and 54% of newly diagnosed or recently treated cancer patients (i.e., within six months post-diagnosis) report sleep difficulties.⁷⁻¹⁰ In addition, a significant proportion of breast cancer patients (i.e., 23% and 44%) experience insomnia symptoms several years after their diagnosis (e.g., two to six years post-diagnosis), which indirectly suggests that insomnia often becomes a chronic problem in breast cancer patients.^{11,12} With an estimated prevalence of about 20% in the general adult population,¹³ it would appear that insomnia complaints are more frequent in cancer patients than in the general population. This hypothesis is further supported by a comparative study in which 40% of cancer patients (mixed diagnoses) reported sleep difficulties compared to only 15% of control participants with no severe illness.¹⁴

Although these studies are consistent in suggesting that sleep

difficulties are highly prevalent in cancer patients, all of them have not made any distinction between symptoms and syndrome of insomnia. This lack of operational definition precludes clear estimates of the proportion of patients meeting diagnostic criteria for an insomnia syndrome. In addition, none of previous surveys have characterized the nature, severity, and duration of sleep difficulties experienced by cancer patients. Also, while it is commonly assumed that insomnia is a transient reaction to cancer that will fade away over time without treatment, this hypothesis needs empirical validation. Moreover, as none of the previous studies has assessed the temporal onset of insomnia in relation to cancer, the proportion of patients for whom insomnia is a reaction to the cancer diagnosis and treatment, rather than the continuation of a pre-existing condition, is unknown.

Risk factors involved in the development of insomnia in the context of cancer is another issue that has yet to be documented. Studies conducted in the general population suggest that some demographic variables are associated with an increased risk to develop insomnia. For example, the risk to develop insomnia increases with aging and is higher among women, unemployed, separated, and widowed individuals, as well as in people living alone.¹⁵⁻¹⁸ The relationship with education level has been less consistent, in that both low education and high education levels have been associated with insomnia.¹⁹

The psychological reaction to the cancer diagnosis and treatment can also play an important role in the development of insomnia. Insomnia is frequently associated with anxiety and depression,²⁰ either as a clinical feature or as a psychiatric diagnosis.²¹ Hence, insomnia is more likely to develop in individuals with these psychological conditions. Other factors that can also exert an influence on sleep include cancer stage, time elapsed since the diagnosis, the recurrence of cancer, medical co-morbid-

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Table 1—Demographic and cancer characteristics of the sample

Variable	n (%)	M (Range)
Age (n=300)		60.0 (28-90)
Marital Status (n=300)		
Married/Live with partner	188 (62.6)	
Single	38 (12.7)	
Separated/Divorced	30 (10.0)	
Widowed	44 (14.7)	
Education Level (n=298)		
Primary	77 (25.8)	
Secondary/High School	111 (37.3)	
College	64 (21.5)	
University	46 (15.4)	
Current Occupation (n=299)		
Work (full and part time)	94 (31.4)	
Unemployed	58 (19.4)	
Retired	128 (42.8)	
Sick leave	19 (6.4)	
Annual Family Income (n=267) ^a		
\$10,000 and less	40 (15.0)	
between \$10,001 and \$20,000	59 (22.1)	
between \$20,001 and \$30,000	55 (20.6)	
between \$30,001 and \$40,000	46 (17.2)	
between \$40,001 and \$50,000	27 (10.1)	
more than \$50,000	40 (15.0)	
Initial Cancer Stage (n = 298)		
Stage 1	165 (55.4)	
Stage 2	106 (35.6)	
Stage 3	27 (9.0)	
Time (months) Elapsed Since Initial Diagnosis (n=300)		48.6 (2-357)
Type of Surgery (n=295)		
Lumpectomy	262 (88.8)	
Total mastectomy	33 (11.2)	
Adjuvant Systemic Treatments (n=300) ^b		
Chemotherapy	115 (38.3)	
Hormone therapy	163 (54.3)	
Bone marrow transplant	5 (1.7)	
Menopausal Status (n=300)		
Postmenopausal	257 (85.6)	
Premenopausal	29 (9.7)	
Perimenopausal	11 (3.7)	
Don't know	3 (1.0)	

Note. ^aIn Canadian dollars. ^bTotal lower than 300 because not all patients who answered that question received adjuvant systemic treatments.

ity, and cancer treatments.

Cancer treatments can influence the development of insomnia through their emotional impact or their side effects. One study found no difference between breast cancer patients (stages 1 and 2) treated with a mastectomy and those treated with lumpectomy in the frequency of sleep disturbances measured using a semi-structured interview, elaborated for the purpose of this study and

different than the interview used in the present study, 4 and 13 months after surgery.²² However, women who had received radiotherapy reported more sleep disturbances four-month post-surgery compared to those who had not been treated with radiation therapy. This difference disappeared 13 months after the surgery, suggesting a temporary reaction to radiotherapy. Another study showed that patients reporting more post-

chemotherapy nausea and vomiting also reported more frequent insomnia complaints,²³ which could be explained by a greater utilization of some anti-emetic medications known to disturb sleep (e.g., dexamethasone^{24,25}).

Another hypothesis, not yet tested, is that the occurrence of menopausal symptoms, such as hot flashes, caused by chemotherapy²⁶ and hormone therapy²⁷ could increase the risk for insomnia. Studies conducted among healthy women have shown that hot flashes are associated with sleep alterations²⁸⁻³¹ and, conversely, that estrogen replacement therapy improves sleep.^{28,32,33} Accordingly, Couzi et al.¹¹ observed a positive association between the severity of hot flashes and the prevalence of sleep difficulties in breast cancer patients. Also, in a recent study, 95% of the women for whom breast cancer treatment precipitated estrogen deficiency reported insomnia and/or dysphoria (data were not computed separately).³⁴

The goals of this descriptive study were to: (a) Estimate the proportion of women who had been treated for breast cancer meeting diagnostic criteria for an insomnia syndrome; (b) describe clinical characteristics of sleep difficulties observed in these patients (e.g., type, duration, severity); (c) retrospectively evaluate the influence of cancer on the insomnia course; and (d) cross-sectionally examine the relationship between potential risk factors (e.g., demographics and cancer characteristics) and the presence of sleep disturbances.

METHOD

Participants

The sample was composed of Caucasian and French-speaking women who had received treatment for non-metastatic breast cancer. All patients were recruited consecutively in the radiotherapy department of l'Hôtel-Dieu de Québec. This sample was chosen because most breast cancer patients with non-metastatic disease currently receive radiotherapy (usually after lumpectomy) and, consequently, would constitute a representative sample. Among the 339 women invited to participate, 11 were excluded because of language or cognitive difficulties and 28 refused to participate, leaving 300 patients in the final sample (88% of the solicited women). Lack of interest was the most frequent reason to decline participation in the study (n=7).

Demographic and cancer characteristics of the sample are shown in Table 1. The mean age was 60 years old (range: 28 to 90 years of age) and the majority of women (63%) were married or living with a partner. Most women were initially treated for an early stage breast cancer (Stages 1 and 2; 91%) with lumpectomy (89%) and a combination of radiotherapy and systemic adjuvant therapy (i.e., chemotherapy and/or hormone therapy). Twenty-eight (9%) women had a cancer recurrence in the interval between the initial diagnosis and the interview, 111 (49%) presented a concurrent physical illness, and 29 (13%) had concurrent psychological difficulties. Finally, 45 (15%) women reported they had sleep difficulties in the past.

Procedure

A research assistant asked all patients to participate in this study at one of their appointments with their radiation oncologist. The purpose of the study was explained and those patients who

agreed to participate signed the informed consent form. Then, all participants completed an insomnia screening questionnaire. Those who reported sleep difficulties ("Do you currently have a sleep problem?") and/or using sleeping aids ("Do you currently use prescribed or over-the-counter medications, drugs, or alcohol to help you sleep") on a dichotomic scale ("yes" or "no") were contacted by a trained research assistant, usually within two weeks after the visit to the clinic, to administer by phone the Insomnia Interview Schedule-Revised (IIS-R).¹⁹ The study was conducted according to the provisions of the Declaration of Helsinki and its amendments.

Measures

Insomnia Screening Questionnaire

This 33-item self-report measure, developed by our research team and that has not been validated, was designed to assess the presence of current and past insomnia symptoms. It was also aimed at gathering information on demographic variables, as well as on medical and psychiatric history. The Sleep Impairment Index (SII),¹⁹ a validated instrument yielding a quantitative index of insomnia severity, was integrated within the screening questionnaire. The SII assesses, on a five-point scale, the perceived severity of sleep onset, sleep maintenance, and early morning awakenings problems, satisfaction with current sleep pattern, degree of interference with daily functioning, noticeability of impairment due to the sleep disturbance, and the degree of worry or concern caused by sleep disturbances. The total SII score, obtained by summing the seven ratings, ranges from 0 to 28. The original English version of the SII and its French-Canadian adaptation have adequate internal consistency, a good concurrent validity, and are sensitive to clinical changes.^{35,36}

Insomnia Interview Schedule (IIS) – Revised

This semi-structured clinical interview¹⁹ is used to gather information for the assessment and diagnosis of insomnia syndrome according to the combined criteria of the *International Classification of Sleep Disorders*³⁷ and the DSM-IV,²¹ and those typically used in clinical research : (a) difficulty initiating (i.e., 30 min. or more to fall asleep) or maintaining sleep (i.e., 30 minutes or more of nocturnal awakenings), with a corresponding sleep efficiency (i.e., ratio of total sleep time to time spent in bed) lower than 85%; (b) the sleep problem occurs at least three nights per week; and (c) the sleep disturbance causes significant daytime impairment (e.g., fatigue, mood disturbances) or marked distress. The IIS was also designed to obtain a sleep history (including use of sleeping pills and other self-help strategies), and to gather information about the characteristics (e.g., nature, severity, and duration), antecedents, consequences, precipitating, and perpetuating factors of insomnia. For the purpose of this study, questions were added to the original IIS to assess the contribution of some risk factors specific to the breast cancer context (e.g., cancer treatments) and to determine the temporal relationship between the cancer diagnosis and the onset of sleep disturbance. The IIS-R was administered by phone.

Statistical Analyses

Descriptive statistics (i.e., mean, median, percentage) were computed to characterize the sample, estimate the prevalence of insomnia (symptoms and syndrome), and capture clinical characteristics of insomnia. Two logistic regressions were performed to identify demographic, medical, and psychological predictors of insomnia symptoms and syndrome. Logistic regressions were selected because most variables exhibited a non-normal distribution.³⁸ Variables entered in each equation included age, marital status, education level, family annual income, current occupation, cancer stage at initial diagnosis, time elapsed since initial diagnosis, the occurrence of a cancer recurrence, type of surgery, chemotherapy, hormone therapy, medical and psychological comorbidity, current menopausal status, and personal antecedents of insomnia symptoms. In addition, to explore the possibility of an additive effect of adjuvant systemic treatments, the interaction of chemotherapy and hormone therapy was also entered in each equation.

Variables were entered in the equation using a stepwise procedure based on the significance of each predictor (Wald statistic criteria). All analyses were conducted with SPSS software, version 9.0,³⁹ and alpha level was fixed at 5%. Standardized residuals were examined to detect outliers, which were excluded from the final model (less than 2% of data). Two variables (i.e., income and use of psychotropic medication) were excluded from the final model because there were too many missing data and because univariate chi-square statistics showed that these two variables were not significantly associated with insomnia (all $p > .50$).

RESULTS

Prevalence of Insomnia

Participants were considered to have current insomnia symptoms when they reported on the screening questionnaire current sleep difficulties or using a sleep-promoting substance. A total of 145 women (48% of the sample) reported current sleep difficulties and 83 (28% of the sample) reported they were currently using hypnotic medications, most frequently a benzodiazepine (82%). When the two criteria were combined, 51% of the total sample ($n=154$) was considered to display current insomnia symptoms (hereinafter called patients with insomnia symptoms). Using the same criteria, forty-five (15%) participants reported a past history of sleep difficulties. Among the patients with current insomnia symptoms ($n=154$), 137 underwent the phone diagnostic interview (i.e., IIS-R), but some clinical data necessary for establishing a diagnosis were missing for eight patients. The interview indicated the presence of an insomnia syndrome in 43% of these 129 participants ($n=56$; hereinafter called patients with insomnia disorder or syndrome), which represents 19% of the total sample.

Characteristics of Sleep Difficulties

Types

Among patients with insomnia symptoms ($n = 154$), 61% reported taking more than 30 minutes to initiate sleep, while 72% reported to be awake for more than 30 minutes at least one night

per week. The pattern was similar in women meeting diagnostic criteria for an insomnia syndrome. In fact, 75% reported sleep onset insomnia, 86% complained of problems with sleep maintenance, and 73% reported awakening too early in the morning. Seventy-one percent of women with an insomnia disorder had mixed difficulties initiating and maintaining sleep.

Duration

Among all women reporting insomnia symptoms, the median duration of sleep difficulties at the time of the interview was 48 months, while the median duration was 60 months among those meeting diagnostic criteria for an insomnia syndrome. In the later sub-group, 95% was suffering of chronic insomnia (i.e., duration of six months and more), while the remaining patients had either acute (lasting one month or less; 1%) or subacute (lasting between one and six months; 4%) insomnia.

Severity

Insomnia severity was estimated with the SII. Women with an insomnia syndrome obtained a mean SII score of 13.6 ($SD=3.9$), which falls near the clinical range (score of 15 or higher).³⁵ Those reporting insomnia symptoms, but not meeting criteria for an insomnia syndrome, obtained a mean SII score of 8.3 ($SD = 4.2$), which falls in the subthreshold insomnia range. A two-tailed t-test revealed that it was significantly higher in women with an insomnia disorder diagnosis, $t(152)=-7.71$, $p<.0001$. A Pearson's correlation indicated no significant relationship between the SII score and the time elapsed since the cancer diagnosis, $r(139)=-.13$, $p=.13$.

Relationship of Cancer to Insomnia Course

Time of Insomnia Onset from Cancer Diagnosis

Among patients who completed the interview ($n=136$, one data missing), 33% ($n=45$) judged that the onset of their sleep difficulties followed the cancer diagnosis. For the remaining 91 patients (67%), sleep disturbance was a pre-existing problem, with a mean duration of 262 months (range=1 to 884 months) prior to the cancer diagnosis. Figure 1 shows the distribution of time elapsed from the cancer diagnosis to the onset of insomnia for the first sub-group (data available on 33 of 45 patients). Most of the patients (76%, $n=25$) who reported that insomnia followed the cancer diagnosis estimated that it began within six months after the cancer diagnosis. About half of them (52%, $n = 13$) estimated that insomnia began within one month post-diagnosis.

Subjective Influence of Cancer Diagnosis and Treatment on Insomnia Course

Among patients who reported insomnia symptoms and underwent the clinical interview, 58% (79 of 136 patients) reported that cancer either caused or aggravated their sleep difficulties. The reason most frequently reported was stress or worry associated with cancer (87% of the cases; 41 of 47 available patients). In addition, 56% (76 of 136 patients) of these patients reported that cancer treatments was a causal or an aggravating factor of sleep disturbances. The most frequently identified treatments were

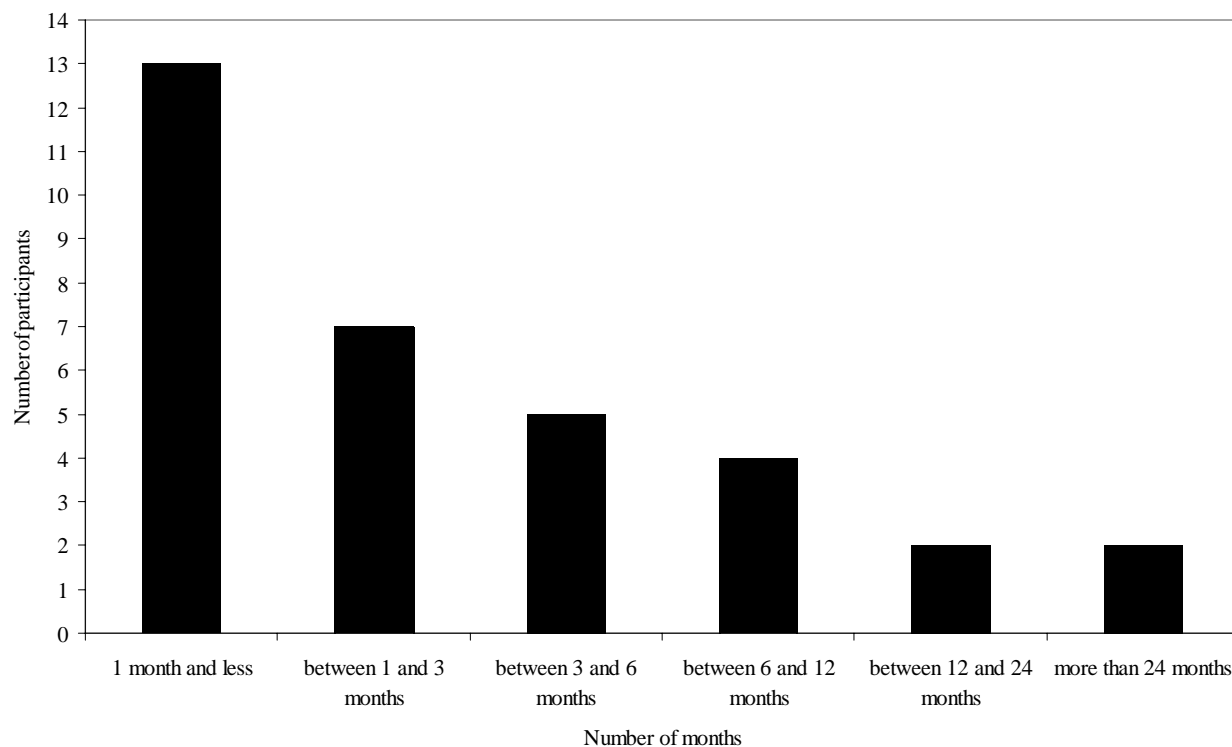


Figure 1—Time of insomnia onset from cancer diagnosis

radiotherapy (43% of the cases; 33 of 76 patients) and chemotherapy (49% of the cases; 37 of 76 patients). Factors associated with cancer treatments that were reported to play a role in the development or aggravation of insomnia symptoms included pain (29%; 14 of 49 patients), stress (26%; 13 of 49 patients), and menopause symptoms (20%; 10 of 49 patients). Finally, 35% of the patients (48 of 136 patients) with insomnia symptoms reported that pain caused or aggravated their sleep difficulties, and 75% of them (35 of 47 patients) reported that pain originated from cancer treatments.

Risk Factors for Insomnia Symptoms

Data from 212 participants (71% of the total sample) were available to predict the presence of insomnia symptoms. A moderate adjustment level was obtained between predicted and observed data ($R^2=.33$, Goodness of fit $\chi^2(8)=7.45$, ns). As shown in Table 2, seven variables were significantly associated with the presence of insomnia symptoms, which together correctly classified 71% of the participants (sensitivity=86%; specificity=44%). Variables that were found to increase the relative risk (i.e., odds ratio; OR) to report insomnia symptoms were sick leave (OR=14.1) or unemployment (OR=3.8), widowhood (OR=4.7), to have no antecedent of insomnia symptoms (OR=5.6), to had undergone lumpectomy (OR=5.2), to had received chemotherapy (OR=4.3), and a less severe cancer stage at initial diagnosis (OR=.46).

Risk Factors for Insomnia Syndrome

The prediction of the presence of an insomnia syndrome was

based on 136 participants (88% of the patients with insomnia symptoms). Results indicated a modest, but significant, adjustment level between predicted and observed data ($R^2=.25$, Goodness of fit $\chi^2(6)=4.71$, ns). As shown in Table 3, only three variables were found to be significantly associated with the presence of an insomnia syndrome diagnosis. Together, these variables correctly classified 70% of the participants (sensitivity=38%; specificity=88%). Variables that increased the relative risk to meet diagnostic criteria for an insomnia disorder were to hold a university degree (OR=4.0) and to be separated (OR= 4.2). Further, widows were significantly less likely to have an insomnia syndrome (OR=.08).

DISCUSSION

The primary goal of this study was to estimate the prevalence of insomnia in women who had been treated with radiotherapy for non-metastatic breast cancer. Approximately half (51%) of the sample reported current insomnia symptoms and one fifth (19%) met diagnostic criteria for an insomnia syndrome. While the 51% rate of insomnia symptoms is consistent with prior data collected in breast cancer patients,⁴⁰ the present study was the first to estimate the prevalence of an insomnia syndrome defined with specific diagnostic criteria in the context of cancer. Although no direct comparison was made, the present findings suggest that insomnia syndrome is more prevalent in women with breast cancer than in the general population. Indeed, epidemiological surveys using a similar definition of insomnia have found prevalence rates ranging from 9% to 12% in representative community samples^{16,18} compared to 19% in the present study. Hence, it would appear that breast cancer patients have almost

Table 2—Logistic regression results for the presence of insomnia symptoms (n=212)

Predictor	B	Wald χ^2	OR	95% CI
Sick leave	2.65	4.28*	14.1	1.1-173.8
Unemployment	1.34	4.25*	3.8	1.1-13.6
Widowhood	1.55	6.78**	4.7	1.5-15.2
Antecedents of insomnia symptoms	-1.72	9.91**	0.18	0.06-0.52
Lumpectomy	1.64	6.61**	5.2	1.5-18.1
Chemotherapy	1.46	9.95**	4.3	1.7-10.7
Cancer stage at diagnosis (I-III)	-0.78	5.47*	0.46	0.24-0.88

Note. * p<.05; ** p<.01; OR=odds ratio; CI=confidence interval.

Table 3—Logistic regression results for the diagnosis of insomnia syndrome (n=136)

Predictor	B	Wald χ^2	OR	95% CI
University degree	1.38	4.18*	4.0	1.1-15.0
Separated/Divorced	1.45	6.34*	4.2	1.4-13.1
Widowhood	-2.54	5.65*	0.08	0.01-0.64

Note. * p<.05; OR=odds ratio; CI=confidence interval.

twice the risk to display clinical levels of insomnia.

The present results need to be interpreted cautiously in light of some methodological limitations. First, the proportion of missing data (12% at the initial assessment and 11% at the phone interview) may limit the generalization of the findings. In addition, although it is unlikely that patients who denied sleep difficulties and using hypnotic medications at the screening questionnaire would have met the diagnostic criteria for an insomnia disorder, it would have been an optimal strategy to administer the phone interview to all study participants. More importantly, the phone interview did not allow to distinguish insomnia diagnostic subtypes. Hence, it was not possible to determine the exact proportion of patients presenting primary and secondary insomnia, nor it was possible to further discriminate patients with psychophysiological insomnia, sleep state misperception, and insomnia secondary to other sleep or psychiatric disorders, or to medical conditions. A more thorough evaluation of psychiatric comorbidity and other sleep disorders using a face-to-face clinical interview, and in some cases, polysomnographic assessments would have been needed to do so.

Another goal of this study was to identify clinical characteristics of sleep difficulties in terms of type, duration, and severity. The majority of women meeting criteria for an insomnia syndrome had chronic (median duration of five years) and mixed sleep onset and maintenance difficulties. Even among women not meeting criteria for an insomnia syndrome, the median duration of their insomnia symptoms was four years. Thus, whether insomnia exceeds threshold for a disorder or not, sleep difficulties become chronic in most breast cancer patients. The insomnia severity as assessed by the SII fell near the clinical range for women with an insomnia syndrome. It is also noteworthy that the severity of sleep disturbances among this subgroup was comparable to that observed in primary insomniacs (i.e., with no medical condition associated).^{41,42} Hence, it appears that insomnia is generally a severe and long lasting problem in breast cancer patients.

Another objective of the present study was to retrospectively examine the influence of cancer on insomnia development and

aggravation. This is particularly important because insomnia is a frequent problem in the general (healthy) population and, therefore, it would be erroneous to conclude that all insomnia problems in this study were direct consequences of breast cancer. When asked whether insomnia began before or following the breast cancer diagnosis, 33% of women with insomnia symptoms indicated that their sleep problem followed the cancer diagnosis, while 67% reported that it was a pre-existing problem. Among those reporting that insomnia followed the breast cancer diagnosis, 76% reported that insomnia began within six months of the breast cancer diagnosis, suggesting a probable causal relationship between the cancer diagnosis and treatment and the development of insomnia. Although one might argue that only a small proportion of insomnia cases are caused by breast cancer, our data suggest that cancer may also aggravate pre-existing sleep disturbances in vulnerable individuals. Indeed, 58% of women with insomnia symptoms reported that cancer either caused or aggravated their sleep difficulties. Such aggravation might involve occasional and mild sleep difficulties that would turn into a severe and chronic insomnia syndrome following the announcement of breast cancer diagnosis.

A final goal of this study was to cross-sectionally identify risk factors for insomnia. One analysis sought to identify factors that predicted the presence of insomnia symptoms among all study participants. Consistent with data from the general population, women who were on a sick leave, unemployed, and widowed were at greater risk to report insomnia symptoms.^{16,18} Also, chemotherapy was associated with a higher risk for insomnia symptoms. Moreover, many patients reported that chemotherapy had caused or aggravated their sleep difficulties. This may be explained by a higher utilization of antiemetic drugs or the occurrence of menopausal symptoms, although this study cannot determine exactly what factors are involved.

The result indicating that lumpectomy was associated with an increased risk to report insomnia symptoms was unexpected and is rather intriguing considering that lumpectomy is a less disfiguring and probably less distressing surgical procedure. Previous research that compared the psychological reaction to mastectomy

and lumpectomy have often found no difference between these two surgical procedures,⁴³ and only one study reported slightly worse psychological outcome with lumpectomy.⁴⁴ It has been suggested that women who undergo lumpectomy are more distressed because of the fearful thought that cancer cells could have been left in their breast.⁴⁵ Also, women who undergo lumpectomy usually have a lower cancer stage and a better prognosis. This observation is consistent with another unexpected result that women with a less severe cancer at initial diagnosis were at increased risk for insomnia symptoms. Another contra-intuitive finding is that women with antecedents of insomnia symptoms were less likely to report insomnia symptoms at the interview. While difficult to explain, these results might be an artifact of how the questions were formulated. Participants were asked to indicate only the presence of past sleep difficulties that went into complete remission. Thus, women who had experienced sleep difficulties for years without remission were not considered to have a past history of insomnia (they were considered to have current chronic insomnia symptoms).

A second analysis was performed to identify factors which increase the risk for women with insomnia symptoms to meet diagnostic criteria for an insomnia syndrome. Separated women were more at risk to present an insomnia syndrome, a result again consistent with data from the general population.^{16,18,46} However, widowed women were less likely to present this syndrome. Also, women with a university degree had an increased risk to suffer from an insomnia syndrome. As mentioned earlier, relationship between education and insomnia in the general population has not been found stable across studies. It may be that women more educated are more likely to seek information about their condition and to be aware of the risk of cancer recurrence, factors not evaluated in this study.

It is noteworthy that several variables that were hypothesized to be involved in the development of insomnia were not found to be significant predictors in the present study. The most striking are probably psychological co-morbidity and hormone therapy. However, psychological disturbances were not optimally assessed in this study, as participants were only asked to say whether they were having psychological difficulties at the time of the interview. To examine more closely the influence of psychological co-morbidity, future research should assess psychological disturbances (e.g., depression, anxiety) with a structured diagnostic interview or at least with well-validated psychometric instruments. Also, more research is needed to assess the role of hormone therapy on insomnia development, since many women receiving hormone therapy and seeking treatment for insomnia spontaneously report hot flashes as a contributing factor. Laboratory studies, such as those conducted in menopausal women of the general population, is a promising area for future research.

The fact that we were unable to assess the contribution of pain in the development of insomnia in the regression analyses (no specific measure of pain was administered) is another limitation of this study. This may be an important risk factor to assess in future research since 35% of our patients reported that pain caused or aggravated their sleep difficulties. Also, because our sample was restricted to women who received radiotherapy, we could not assess the specific role of this treatment on insomnia development. Again, a large proportion of women (43%) subjectively identified radiotherapy as a causal or aggravating

factor. Another limitation of this study was the retrospective assessment of sleep difficulties history.

In spite of these limitations, we can conclude that insomnia is a highly prevalent problem in breast cancer patients. Although it is not always a direct consequence of breast cancer, pre-existing sleep difficulties are frequently exacerbated by cancer. Risk factors include demographic variables and cancer-specific variables (i.e., cancer stage and treatment). In most cases, insomnia is severe, chronic, and involves mixed sleep onset and maintenance difficulties. Hence, the importance of offering appropriate treatment to cancer patients, ideally before the problem becomes chronic.

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