ORIGINAL ARTICLE

Prevalence of depression and its related factors among Chinese women with breast cancer

XIAOLI CHEN[1], YING ZHENG[2], WEI ZHENG[1], KAI GU[2], ZHI CHEN[1], WEI LU[2] & XIAO OU SHU[1]

[1]*Department of Medicine, Vanderbilt Epidemiology Center, Vanderbilt-Ingram Cancer Center, Vanderbilt University Medical Center, 2525 West End Avenue, Suite 600, Nashville, TN 37203, USA and* [2]*Shanghai Institute of Preventive Medicine, 1380 Zhong Shan Road (W), Shanghai, 200336, China*

Abstract

Background. Little information is available regarding depression among Asian breast cancer survivors. *Methods.* We estimated the prevalence of depression and its correlates among 1400 participants of a population-based cohort study of women with stage 0–IV breast cancer in Shanghai, China. Through in-person interviews conducted at 6 months and 18 months post-diagnosis and review of medical charts, information on sociodemographic and clinical factors and quality of life (QOL) was collected. Depression was measured by the 20-item Center for Epidemiologic Studies Depression Scale at 18 months post-diagnosis. *Results.* Approximately 26% of participants had mild to severe depression and 13% fulfilled the criteria of clinical depression at 18 months post-diagnosis. Women with lower income were more likely to have depression than women with higher income (prevalence: 16.6% vs. 6.9% for mild depression and 17.1% vs. 5.5% for clinical depression, respectively). Depression was more common among women who were widowed (18.9%) or divorced/separated/single (16.4%) than among women who were married (11.8%). Women with comorbidity were more likely to have clinical depression (17.3% vs 11.2%). Multivariate analysis showed that low income, marital status, comorbidity, and low QOL scores were independent predictors for depression. We did not find that prevalence of depression differed by menopausal status, estrogen or progesterone receptor status, disease stage, or cancer-related treatments. *Conclusion.* Depression is common among Asian women with breast cancer. Routine screening and prevention of depression are warranted among women with breast cancer.

Key Words: *Depression, breast cancer, prevalence, risk factor*

Breast cancer is the most common malignancy among women in the US and many other countries in the world. Due to advances in early diagnosis and treatment, the population of breast cancer survivors is growing rapidly worldwide. Many breast cancer patients and survivors battle psychological distress caused by the consequences of cancer diagnosis and the sequelae of cancer-related treatment [1,2]. It has been reported that depression occurs in 1.5 to 55% of women with breast cancer within 6 months of diagnosis [1–16]. The variation in estimates of depression prevalence can be attributed to differences in study time frame, criteria for depression, disease stage, and study population [1,2,14].

Although there are numerous reports on depression and its correlates, the relation between sociodemographic and clinical factors and depression after diagnosis of breast cancer remain controversial [1,2,13–15,17]. It has been suggested that sociodemographic factors, such as age, marital status, and socioeconomic status are associated with depression [1,2,14,15,17–19]. Some studies have linked cancer-related treatment or cancer stage with depression [17,18,20], whereas others have failed to find such connections [1,2,9,14–16].

Most studies of depressive symptoms have been conducted among women with early stage breast cancer [1,2,8,13–15], and most were based on cross-sectional surveys [1,4,8,10,13,17]. Furthermore,

existing data on clinical depression among breast cancer patients/survivors come mainly from Western populations; little information is available about Asian breast cancer patients and survivors. Given the considerable variability in the prevalence of depression and proposed risk factors found in Western populations and the limited information about depression in Asian women, a better understanding of depression and its correlates in Asian populations would be informative for provision of appropriate services and targeted intervention for women at high risk for depression.

By using data from a population-based cohort study of women diagnosed with stage 0–IV breast cancer, we estimated the prevalence of depression approximately 18 months after cancer diagnosis. We also evaluated the association of sociodemographic and clinical factors, as well as QOL assessed approximately 6 months post-diagnosis, with depression assessed at 18 months post-diagnosis.

Methods

Study participants

Study participants were women who were diagnosed between March 2002 and April 2006 with a primary breast cancer and enrolled in the Shanghai Breast Survival Study (SBCSS), a population-based cohort study of breast cancer survivors in Shanghai, China. Details of the SBCSS have been described elsewhere [21,22]. Briefly, through the population-based Shanghai Cancer Registry, 6 299 women were identified approximately 6 months after diagnosis of incident breast cancer and were invited to participate in the study. A total of 5 042 women provided written, informed consent and enrolled in the study. These participants were followed through in-person interviews administered at approximately 18 months after cancer diagnosis. Of these, 1 400 cases were invited to participate in a depression survey administered as part of the 18-month follow-up interview. Women who participated in the depression survey were similar to the entire study population with regard to social demographics, age at cancer diagnosis, and clinical characteristics. The SBCSS was approved by the Institutional Review Boards of all institutions involved in the study.

Data collection

Structured questionnaires were administered by trained interviewers through in-person interviews to collect information on sociodemographic, clinical, and lifestyle characteristics, as well as QOL and depression. Age at diagnosis, education, monthly household income, marital status, menopausal status, and menopausal symptoms were assessed. Disease- and treatment-related information was collected, including stage of tumor-node metastasis (TNM) at the time of primary diagnosis, estrogen receptor (ER) and progesterone receptor (PR) status, type of surgery, chemotherapy, radiotherapy, immunotherapy, and tamoxifen use. Additionally, medical charts were reviewed to verify diagnosis, treatment, and disease stage information. ER and PR status were included in the analyses in the following joint categories: ER+/PR+ (receptor-positive), ER-/PR- (receptor-negative), and ER-/PR+ or ER+/PR- (mixed). The Charlson comorbidity index was created based on a validated comorbidity scoring system [23] and the diagnostic codes from the International Classification of Disease, 9th revision (ICD-9) [24].

The Medical Outcomes Short Form-36 Health Survey (SF-36) was administered at the baseline interview to evaluate participants' QOL. The SF-36 is a generic health outcome measure with 36 items spread across eight health scales: physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. The scale scores can be consolidated into two summary measures of health: the Physical Health Summary and the Mental Health Summary. Total QOL and scale scores range from 0 to 100, with higher scores representing better QOL or health status. The SF-36 has been validated in the Chinese population [25] and has been used in epidemiological studies of breast cancer patients and survivors [26,27].

The Center for Epidemiologic Studies Depression Scale (CES-D) was used as a measure of depression [28]. The 20-item CES-D scale measures depressive symptoms experienced in the week prior to its administration. Individual items are scored on a four-point scale, and the total score ranges from 0 to 60, with a higher score indicating more depressive symptoms. A total score of 0–9 suggests that the individual is not depressed, a score of 10–15 suggests mild depression, and a score ≥16 indicates clinical depression [28]. The Chinese version of the CES-D has been validated [29].

Statistical analysis

The prevalence of depression was computed as the percentage of women with mild and clinical depression at 18 months post-diagnosis. Median distributions were used to categorize QOL scores. The χ^2 test was conducted to examine differences in the

prevalence of depression across sociodemographic and clinical characteristics. Cases without depression (total depression score <10) served as the reference in multinomial logistic regression analyses that were conducted to evaluate sociodemographic and clinical factors in relation to mild and clinical depression. Only factors significantly related to depression in univariate analysis were included in our multivariate logistic regression analysis. Odds ratios (ORs) and 95% confidence intervals (95% CIs) were calculated. The SF-36 QOL-related mental health index scale has been used to screen for mood disorders in the general population [30] and for depression among HIV outpatients [31], and was shown to be more predicative of prevalence of depression than any other QOL scale in our study population. For these reasons, it was included in the multivariate analysis along with sociodemographic and clinical factors as an indicator of depression at baseline. We also applied a modified 26-item CES-D, which includes an additional six questions specifically designed for the Chinese population [29]. We found high correlation between the 20-item CES-D and the 26-item CES-D scores (Spearman correlation coefficient: 0.98). Results of additional analyses conducted using data from the 26-item CES-D were similar to results generated by the 20-item CES-D (data not shown). Given that the 20-item CES-D is widely used in clinical and epidemiological studies on depression, in this report we present only results based on the 20-item CES-D. All tests were performed by using Statistical Analysis Software (SAS, version 9.1; SAS Institute, Inc., Cary, North Carolina). The significance levels were set at p <0.05 for two-sided analyses.

Results

Of the 1 400 study participants, the average age at cancer diagnosis was 53.7 years (standard deviation: 9.8), 44% had less than a high school education level, 88% were married, and 53% were post-menopausal. At 18 months post-diagnosis, 26% of women had symptoms of depression, and 12.6% fulfilled the criteria for clinical depression (Table I). Women who were older at diagnosis were more likely to have depressive symptoms. The prevalence of clinical depression increased with age and was higher for women with lower income than for women with higher income. Depression was more common among women who were widowed (19%) or divorced/separated/single (16%) compared with women who were married (12%). There was no significant difference in the prevalence of depression by menopausal status.

Approximately 83% of women experienced menopausal symptoms after cancer diagnosis, 22% had a Charlson comorbidity index of 1 or higher, 41% had stage 0–I breast cancer, and 9% had stage III–IV

Table I. Demographic characteristics and related prevalence of depression at 18 months post-diagnosis⋆.

| Characteristics | N | % | Prevalence (%) | | | P-value |
			Without depression (n = 1036)	Mild depression (n = 188)	Clinical depression (n = 176)	
Age at diagnosis (year)						0.234
<40	64	4.6	82.8	14.1	3.1	
40–49	515	36.8	73.4	13.6	13.0	
50–59	469	33.5	75.5	13.0	11.5	
≥60	352	25.1	71.3	13.6	15.1	
Education level						0.028
<High school	619	44.2	70.8	13.6	15.7	
High school	547	39.1	76.2	13.0	10.8	
>High school	234	16.7	77.4	14.1	8.6	
Income (yuan/month/capita)						<0.001
<1000	645	46.1	66.4	16.6	17.1	
1000–1999	554	39.6	78.0	12.1	9.9	
≥2000	201	14.4	87.6	6.9	5.5	
Marital status						0.006
Married	1234	88.1	75.6	12.6	11.8	
Widowed	111	7.9	60.4	20.7	18.9	
Divorced/separated/single	55	3.9	65.5	18.2	16.4	
Menopausal status						0.907
Pre-menopausal	660	47.1	74.6	13.2	12.3	
Post-menopausal	740	52.9	73.5	13.7	12.8	

⋆χ^2 test was conducted to test differences in the prevalence of depression among breast cancer survivors without depression, with mild depression, and with clinical depression.

Table II. Disease characteristics and related prevalence of depression among breast cancer survivors at 18 months post-diagnosis.

Characteristics	N	%	Prevalence (%)			P- value
			Without depression (n =1036)	Mild depression (n =188)	Clinical depression (n =176)	
Menopausal symptoms						<0.001
Yes	1156	82.6	71.1	14.6	14.3	
No	244	17.4	87.7	7.8	4.5	
Charlson comorbidity index						0.002
0	1087	77.6	76.2	12.6	11.2	
≥1	313	22.4	66.5	16.3	17.3	
ER/PR status						0.515★
ER/PR positive	707	50.5	72.1	14.9	13.0	
ER/PR negative	386	27.6	76.4	11.4	12.2	
ER/PR mixed	288	20.6	75.0	12.5	12.5	
ER/PR unknown	19	1.4	79.0	15.8	5.3	
TNM stage						0.266★
0–I	570	40.7	75.6	13.2	11.2	
IIA	456	32.6	72.2	12.5	15.4	
IIB	185	13.2	76.2	15.1	8.7	
III–IV	123	8.8	71.5	13.8	14.6	
Unknown	66	4.7	71.5	13.8	14.6	

★For the χ^2 test, the 'Unknown' group was excluded.

breast cancer (Table II). Half of women (51%) had ER/PR-positive tumors and 28% had ER/PR-negative tumors. Women with menopausal symptoms or comorbidity were more likely to have depression than women who did not. The prevalence of depression varied little by ER/PR status or TNM stage.

Cancer-related treatments and corresponding prevalence of depression are presented in Table III.

Among women who received mastectomy, the prevalence of mild depression was 14% and the prevalence of clinical depression was 13%, whereas among women who received breast-conserving surgery the prevalence of mild depression was 3% and the prevalence of clinical depression was 6%. The prevalence of clinical depression among women who received radiotherapy was 9%, while among women

Table III. Breast cancer treatment and related prevalence of depression among breast cancer survivors at 18 months post-diagnosis.

Characteristics	N	%	Prevalence (%)			P-value
			Without depression (n =1036)	Mild depression (n =188)	Clinical depression (n =176)	
Type of surgery						0.195
Mastectomy	1320	94.3	73.4	13.7	12.9	
Conservation	33	2.4	90.9	3.0	6.1	
Others	47	3.4	78.7	12.8	8.5	
Tamoxifen use						0.677★
Yes	663	47.4	73.8	14.2	12.1	
No	735	52.5	74.2	12.8	13.1	
Unknown	2	0.1	100.0	0.0	0.0	
Chemotherapy						0.840
Yes	1274	91.0	74.1	13.3	12.6	
No	126	9.0	73.0	15.1	11.9	
Radiotherapy						0.004
Yes	447	31.9	79.2	12.1	8.7	
No	953	68.1	71.6	14.1	14.4	
Immunotherapy						0.267★
Yes	222	15.9	72.1	12.2	15.8	
No	1172	83.7	74.3	13.7	12.0	
Unknown	6	0.4	83.3	0.0	16.7	

★For the χ^2 test, the 'Unknown' group was excluded.

who did not receive radiotherapy the prevalence was 14%. No significant differences were observed in the prevalence of depression by ER/PR status, disease stage, type of surgery, tamoxifen use, chemotherapy, or immunotherapy.

Women with lower QOL scores (<median) on each of the eight scales were more likely to report depression than women with higher QOL scores (≥ median) (Table IV). Compared with women who had higher overall QOL scores, women with lower QOL scores were more likely to report mild depression (19% vs. 8%) or clinical depression (21% vs. 4%). Of women with lower QOL scores on the mental health index, approximately 19% were mildly depressed and 22% were clinically depressed, while of women with higher QOL scores, 8% were mildly depressed and 4% were clinically depressed.

Results of multinomial logistic regression analyses are presented in Table V. Independent predictors for clinical depression were having lower household income (OR: 3.13; 95% CI: 1.51–6.48); being widowed (OR: 1.93; 95% CI: 1.03–3.61); being divorced, separated, or single (OR: 2.84; 95% CI: 1.20–6.74); having a higher comorbidity index score (OR: 1.59; 95% CI: 1.05–2.40); and having a lower QOL score (OR: 9.08; 95% CI: 5.65–14.6). Similar results were found for mild depression. Additionally, women with a higher educational level (>high school) were more likely to have mild depression (OR: 1.82; 95% CI: 1.06–3.10). Women who received radiotherapy were less likely to report clinical depression (OR: 0.53; 95% CI: 0.35–0.80). Other factors were not significantly related to depression.

Table IV. Quality of life and prevalence of depression among breast cancer survivors at 18 months post-diagnosis.

			Prevalence of depression (%)			
Quality of life	N	%	Without depression (n = 1036)	Mild depression (n = 188)	Clinical depression (n = 176)	P-Value
Total QOL[a] score						<0.001
<Median	699	49.9	60.2	18.5	21.3	
≥Median	701	50.1	87.7	8.4	3.9	
QOL summary scores						
Physical health						<0.001
<Median	701	50.1	63.5	15.8	20.7	
≥Median	699	49.9	84.6	11.0	4.4	
Mental health						<0.001
<Median	701	50.1	58.4	19.7	22.0	
≥Median	699	49.9	89.7	7.2	3.1	
QOL subscale scores						
Physical functioning						<0.001
<Median	672	48.0	64.7	16.2	19.1	
≥Median	728	52.0	82.6	10.9	6.6	
Social functioning						<0.001
<Median	679	48.5	64.2	16.8	19.0	
≥Median	721	51.5	83.2	10.3	6.5	
Mental health index						<0.001
<Median	693	49.5	59.0	19.3	21.7	
≥Median	707	50.5	88.7	7.6	3.7	
General health perceptions						<0.001
<Median	701	50.1	64.5	16.4	19.1	
≥Median	699	49.9	83.6	10.4	6.0	
Role-physical						<0.001
<Median	1011	72.2	69.9	14.8	15.2	
≥Median	389	27.8	84.6	9.8	5.7	
Bodily pain						<0.001
<Median	663	47.4	65.6	15.5	18.9	
≥Median	737	52.6	81.6	11.5	6.9	
Vitality						<0.001
<Median	695	49.6	62.3	17.3	20.4	
≥Median	705	50.4	85.5	9.7	4.8	
Role-emotional						<0.001
<Median	602	43.0	60.5	18.6	20.9	
≥Median	798	57.0	84.2	9.5	6.3	

[a]QOL: quality of life.

Table V. Multivariate analysis for the association of sociodemographic and clinical characteristics with depression among breast cancer survivors at 18 months post-diagnosis*.

Characteristics	Mild depression OR (95% CI)	Clinical depression OR (95% CI)
Age at diagnosis (years)		
<40	1.00	1.00
40–49	0.95 (0.42–2.16)	3.44 (0.78–15.3)
50–59	0.91 (0.40–2.08)	2.84 (0.64–12.6)
≥60	0.90 (0.38–2.15)	3.91 (0.86–17.8)
Education level		
<High school	1.00	1.00
High school	1.10 (0.75–1.61)	0.81 (0.54–1.21)
>High school	1.82 (1.06–3.10)	1.06 (0.57–1.95)
Income (yuan/month/capita)		
≥2000	1.00	1.00
1000–1999	2.17 (1.14–4.12)	1.69 (0.82–3.47)
<1000	3.72 (1.92–7.21)	3.13 (1.51–6.48)
Marital status		
Married	1.00	1.00
Widowed	2.29 (1.29–4.09)	1.93 (1.03–3.61)
Divorced/separated/ single	2.15 (0.99–4.69)	2.84 (1.20–6.74)
Menopausal symptoms		
No	1.00	1.00
Yes	1.36 (0.79–2.36)	1.63 (0.81–3.27)
Charlson comorbidity index		
0	1.00	1.00
≥1	1.45 (0.98–2.15)	1.59 (1.05–2.40)
Radiotherapy		
No	1.00	1.00
Yes	0.73 (0.51–1.06)	0.53 (0.35–0.80)
QOL (Mental health index scale)		
<Median	3.82 (2.63–5.55)	9.08 (5.65–14.6)
≥Median	1.00	1.00

*Obtained from multinomial logistic regression model with mutual adjustment for other factors listed in the table. Cases without depression (total depression score <10) served as the reference.
OR: odds ratio; 95% CI: 95% confidence interval.

Discussion

In this population-based cohort study, we found that approximately 26% of breast cancer survivors had mild to severe symptoms of depression and 13% met the criteria for clinical depression at 18 months post-diagnosis. Low household income, being single, presence of comorbidity, and low QOL shortly after cancer diagnosis were significantly related to mild and clinical depression. Most clinical features and cancer treatments were not significantly associated with depression. To our knowledge, this is the first study to systematically examine the prevalence of depression and its correlates among Chinese women diagnosed with breast cancer. The prevalence of depression among breast cancer patients and survivors varies widely among studies, most of which have been conducted in Western populations [1,2,4,10,11,13–15,32–36]. Using the Hospital Anxiety and Depression scale (HADS) in a case-control study of 731 Australian women 23–60 years of age with stage I–IV breast cancer, Osborne et al. reported that 12% of women had depression and 3% had clinical depression at approximately 15 months post-diagnosis [4]. In a study of 115 Caucasian women diagnosed with stage I–IV breast cancer in Croatia, 36.5% of patients fulfilled the criteria for clinical depression as assessed by the CES-D at a median time of 7 months since diagnosis [10]. Another study of 210 US women (90% Caucasian, 9% African American, 1% Hispanic) with stage II–III breast cancer, which also used the CES-D, found that 18% were clinically depressed after surgery but before adjuvant therapy [13]. The prevalence of depression as assessed by the CES-D among 189 breast cancer patients was 22% one year after breast cancer treatment in Netherlands [37]. A South Korean study of 1 933 breast cancer survivors with stage 0–III breast cancer reported that 24.9% had moderate to severe depression using the Beck Depression Inventory (BDI) at a mean time 4.6 years after surgery [1]. In our study, we found that the prevalence of clinical depression as assessed by the CES-D at approximately 18 months post-diagnosis was 13% among Chinese women with breast cancer, which is slightly lower than previous findings [1,10,11,13]. It is worth noting that the above studies used different instruments to measure depression (e.g., the CES-D, the HADS, or the BDI). However, it has been shown that these instruments generally compare well and are considered suitable for assessing depression in cancer patients [15,38,39]. Differences in study population, timing of the depression assessment, and disease stage may have contributed to variations in the prevalence of depression observed in our and other studies.

Previous studies on the association of sociodemographic and clinical factors with depression have generated inconsistent results. Some research has reported that depression was related to age [2,15,18], education [17,18], and income [1,15,17], while others have not [4]. A recent nationwide cohort study of 3 343 women treated for early stage breast cancer in Denmark showed that socioeconomically deprived women were vulnerable to depression [15]. In our study, we found that low income was significantly associated with mild and clinical depression, consistent with previous findings [1,11,15,17,19]. Economic concerns are potential barriers to cancer treatment, and economic stress may lead to depression for breast cancer patients [13,40]. Low-income, primary care patients have been found to have

relatively high rates of depression, but are less likely to receive care for depression or to be prescribed antidepressants [41,42]. Our findings, in line with previous studies, suggest that routine depression screening for low income women with breast cancer is important.

Only a few studies have suggested that cancer stage [18,36] or cancer-related treatments [17,20] are risk factors for depression, whereas the majority of existing research has failed to find such associations. For example, it has been reported that the prevalence of depression varies little by type of surgery [9,14–16,34]. Consistent with the majority of studies, we did not find that disease stage, receptor status, or type of surgery was related to depression in our study population.

We also found no association between depression and cancer treatments, including the use of tamoxifen or chemotherapy, which is in line with previous findings [2,14,15,43]. Interestingly, we found that women who received radiotherapy were less likely to have depression. In a randomized, controlled trial of breast cancer patients aged ≥65 years in the UK, Prescott et al. found that women receiving radiotherapy reported less anxiety about recurrence than women who had not received radiotherapy. However, that study did not observe a significant association between receiving radiotherapy and depression [44]. This discrepancy may be the result of different study designs or study populations. Another possible explanation is that women may experience less psychological distress about receiving radiotherapy, since it is typically given to decrease the potential for recurrence or metastasis of breast cancer. Consistent with a recent finding [15], our study indicated that women with a high comorbidity index were more likely to have depression.

Our study also indicated that QOL measured at the baseline survey was significantly and independently associated with depression at 18 months post-diagnosis. Previous studies based on cross-sectional data have shown that depression is inversely related to QOL among breast cancer patients and survivors [1,8,45]. Two recent studies observed that the physical functioning aspect of QOL as assessed by the SF-36 was strongly associated with the prevalence of depressive symptoms among women with early stage breast cancer [14,15]. Similarly, we found a strong association between physical functioning and risk for depression.

Our study has several potential limitations. Although we adjusted for the QOL-related mental health index score measured at the baseline interview in the multivariate analyses, confounding from pre-existing depression cannot be ruled out. In our study, women with lower income had a higher prevalence of depression than women with higher income. However, the nature of the relationship between socioeconomic status and depression remains unclear. Finally, due to differences in the aggressiveness of cancer treatments, disease stage distribution, and lifestyle factors (e.g., obesity, physical activity, and dietary intake) between Chinese women and other populations (e.g., US women), the results of the current study may not be directly generalizable to other populations.

In summary, our population-based cohort study indicates that depression is a major concern for breast cancer survivors. Clinicians and other health care providers should be aware of depression and communicate effectively with breast cancer patients and survivors about depression. Low socioeconomic status, being single, presence of comorbidity, and low QOL scores shortly after cancer diagnosis may identify groups or populations of women with breast cancer that are particularly vulnerable to depression. Our cohort study contributes to the existing literature on depression and provides important information for the development of effective strategies to manage depression among women with breast cancer.

References

[1] Kim SH, Son BH, Hwang SY, Han W, Yang JH, Lee S, et al. Fatigue and depression in disease-free breast cancer survivors: Prevalence, correlates, and association with quality of life. J Pain Symptom Manage 2008;35:644–55.

[2] Burgess C, Cornelius V, Love S, Graham J, Richards M, Ramirez A. Depression and anxiety in women with early breast cancer: Five year observational cohort study. BMJ 2005;330:702.

[3] McDaniel JS, Musselman DL, Porter MR, Reed DA, Nemeroff CB. Depression in patients with cancer. Diagnosis, biology, and treatment. Arch Gen Psych 1995;52:89–99.

[4] Osborne RH, Elsworth GR, Hopper JL. Age-specific norms and determinants of anxiety and depression in 731 women with breast cancer recruited through a population-based cancer registry. Eur J Cancer 2003;39:755–62.

[5] Groenvold M, Fayers PM, Sprangers MA, Bjorner JB, Klee MC, Aaronson NK, et al. Anxiety and depression in breast cancer patients at low risk of recurrence compared with the general population: A valid comparison? J Clin Epidemiol 1999;52:523–30.

[6] Maraste R, Brandt L, Olsson H, Ryde-Brandt B. Anxiety and depression in breast cancer patients at start of adjuvant radiotherapy. Relations to age and type of surgery. Acta Oncol 1992;31:641–3.

[7] Grabsch B, Clarke DM, Love A, McKenzie DP, Snyder RD, Bloch S, et al. Psychological morbidity and quality of life in women with advanced breast cancer: A cross-sectional survey. Palliat Support Care 2006;4:47–56.

[8] Kissane DW, Clarke DM, Ikin J, Bloch S, Smith GC, Vitetta L, et al. Psychological morbidity and quality of life in Australian women with early-stage breast cancer: A cross-sectional survey. Med J Aust 1998;169:192–6.

[9] Rijken M, de Kruif AT, Komproe IH, Roussel JG. Depressive symptomatology of post-menopausal breast cancer patients: A comparison of women recently treated by mastectomy or by breast-conserving therapy. Eur J Surg Oncol 1995;21:498–503.

[10] Aukst-Margetic B, Jakovljevic M, Margetic B, Biscan M, Samija M. Religiosity, depression and pain in patients with breast cancer. Gen Hosp Psychiatry 2005;27:250–5.

[11] Ell K, Sanchez K, Vourlekis B, Lee PJ, Dwight-Johnson M, Lagomasino I, et al. Depression, correlates of depression, and receipt of depression care among low-income women with breast or gynecologic cancer. J Clin Oncol 2005;23:3052–60.

[12] Somerset W, Stout SC, Miller AH, Musselman D. Breast cancer and depression. Oncology (Williston Park) 2004;18:1021–34.

[13] Golden-Kreutz DM, Andersen BL. Depressive symptoms after breast cancer surgery: Relationships with global, cancer-related, and life event stress. Psychooncology 2004;13:211–20.

[14] Bardwell WA, Natarajan L, Dimsdale JE, Rock CL, Mortimer JE, Hollenbach K, et al. Objective cancer-related variables are not associated with depressive symptoms in women treated for early-stage breast cancer. J Clin Oncol 2006;24:2420–7.

[15] Christensen S, Zachariae R, Jensen AB, Vaeth M, Moller S, Ravnsbaek J, et al. Prevalence and risk of depressive symptoms 3-4 months post-surgery in a nationwide cohort study of Danish women treated for early stage breast-cancer. Breast Cancer Res Treat 2009;113:339–55.

[16] Fallowfield LJ, Hall A, Maguire GP, Baum M. Psychological outcomes of different treatment policies in women with early breast cancer outside a clinical trial. BMJ 1990;301:575–80.

[17] Casso D, Buist DS, Taplin S. Quality of life of 5-10 year breast cancer survivors diagnosed between age 40 and 49. Health Qual Life Outcomes 2004;2:25.

[18] Mehnert A, Koch U. Psychological comorbidity and health-related quality of life and its association with awareness, utilization, and need for psychosocial support in a cancer register-based sample of long-term breast cancer survivors. J Psychosom Res 2008;64:383–91.

[19] Pinder KL, Ramirez AJ, Black ME, Richards MA, Gregory WM, Rubens RD. Psychiatric disorder in patients with advanced breast cancer: Prevalence and associated factors. Eur J Cancer 1993;29A:524–7.

[20] Leedham B, Ganz PA. Psychosocial concerns and quality of life in breast cancer survivors. Cancer Invest 1999;17:342–8.

[21] Lu W, Cui Y, Chen X, Zheng Y, Gu K, Cai H, et al. Changes in quality of life among breast cancer patients three years post-diagnosis. Breast Cancer Res Treat 2009;114:357–69.

[22] Chen Z, Gu K, Zheng Y, Zheng W, Lu W, Shu XO. The use of complementary and alternative medicine among Chinese women with breast cancer. J Altern Complement Med 2008;14:1049–55.

[23] Grunau GL, Sheps S, Goldner EM, Ratner PA. Specific comorbidity risk adjustment was a better predictor of 5-year acute myocardial infarction mortality than general methods. J Clin Epidemiol 2006;59:274–80.

[24] Department of Health and Human Services. The international classification of diseases. 9th rev. ed. Clinical modification, ICD-9-CM. Washington, DC: US Government Printing Office; 1998.

[25] Li L, Wang HM, Shen Y. Chinese SF-36 Health Survey: translation, cultural adaptation, validation, and normalisation. J Epidemiol Community Health 2003;57:259–63.

[26] Trentham-Dietz A, Sprague BL, Klein R, Klein BE, Cruickshanks KJ, Fryback DG, et al. Health-related quality of life before and after a breast cancer diagnosis. Breast Cancer Res Treat 2008;109:379–87.

[27] Buijs C, Rodenhuis S, Seynaeve CM, van Hoesel QG, van der Wall E, Smit WJ, et al. Prospective study of long-term impact of adjuvant high-dose and conventional-dose chemotherapy on health-related quality of life. J Clin Oncol 2007;25:5403–9.

[28] Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Appl Psychol Measure 1977;1:385–401.

[29] Lin N. Measuring depressive symptomatology in China. J Nerv Ment Dis 1989;177:121–31.

[30] Rumpf HJ, Meyer C, Hapke U, John U. Screening for mental health: Validity of the MHI-5 using DSM-IV Axis I psychiatric disorders as gold standard. Psychiatry Res 2001;105:243–53.

[31] Holmes WC. A short, psychiatric, case-finding measure for HIV seropositive outpatients: Performance characteristics of the 5-item mental health subscale of the SF-20 in a male, seropositive sample. Med Care 1998;36:237–43.

[32] Yeter K, Rock CL, Pakiz B, Bardwell WA, Nichols JF, Wilfley DE. Depressive symptoms, eating psychopathology, and physical activity in obese breast cancer survivors. Psychooncology 2006;15:453–62.

[33] Goodwin JS, Zhang DD, Ostir GV. Effect of depression on diagnosis, treatment, and survival of older women with breast cancer. J Am Geriatr Soc 2004;52:106–11.

[34] Schou I, Ekeberg O, Ruland CM, Sandvik L, Karesen R. Pessimism as a predictor of emotional morbidity one year following breast cancer surgery. Psychooncology 2004;13:309–20.

[35] Ramirez AJ, Richards MA, Jarrett SR, Fentiman IS. Can mood disorder in women with breast cancer be identified preoperatively? Br J Cancer 1995;72:1509–12.

[36] Aapro M, Cull A. Depression in breast cancer patients: The need for treatment. Ann Oncol 1999;10:627–36.

[37] van Wilgen CP, Dijkstra PU, Stewart RE, Ranchor AV, Roodenburg JL. Measuring somatic symptoms with the CES-D to assess depression in cancer patients after treatment: comparison among patients with oral/oropharyngeal, gynecological, colorectal, and breast cancer. Psychosomatics 2006;47:465–70.

[38] Hann D, Winter K, Jacobsen P. Measurement of depressive symptoms in cancer patients: Evaluation of the Center for

Epidemiological Studies Depression Scale (CES-D). J Psychosom Res 1999;46:437–43.

[39] Berard RM, Boermeester F, Viljoen G. Depressive disorders in an out-patient oncology setting: Prevalence, assessment, and management. Psychooncology 1998;7:112–20.

[40] Kasper AS. Experience of low-income women with breast cancer: Final report to the Agency for Health Care Policy and Research. Center for Research on Women and Gender, University of Illinois, Chicago, IL; 1999.

[41] Miranda J, Cooper LA. Disparities in care for depression among primary care patients. J Gen Intern Med 2004;19: 120–6.

[42] Olfson M, Marcus SC, Druss B, Elinson L, Tanielian T, Pincus HA. National trends in the outpatient treatment of depression. JAMA 2002;287:203–9.

[43] Patten SB, Barbui C. Drug-induced depression: A systematic review to inform clinical practice. Psychother Psychosom 2004;73:207–15.

[44] Prescott RJ, Kunkler IH, Williams LJ, King CC, Jack W, van der Pol M, et al. A randomised controlled trial of post-operative radiotherapy following breast-conserving surgery in a minimum-risk older population. The PRIME trial. Health Technol Assess 2007;11:1–149, iii–iv.

[45] Weitzner MA, Meyers CA, Stuebing KK, Saleeba AK. Relationship between quality of life and mood in long-term survivors of breast cancer treated with mastectomy. Support Care Cancer 1997;5:241–8.