

RESEARCH ARTICLE

Prevalence of Depression in Breast Cancer Survivors: a Systematic Review of Observational Studies

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Abstract

Background: Depression is common in breast cancer patients. The aim of this paper was to make a systematic review of its prevalence and associated factors in breast cancer survivors. **Materials and Methods:** An extensive systematic electronic review (PUBMED, CINAHL, PsycINFO and Ovid) and handsearch were carried out to retrieve published articles up to November 2012, using Depression OR Dysthymia AND (Cancer OR Tumor OR Neoplasms as the keywords. Information about the design of the studies, measuring scale, characteristics of the participants, prevalence of depression and its associated factors from the included studies were extracted and summarized. **Results:** We identified 32 eligible studies that recruited 10,826 breast cancer survivors. Most were cross-sectional or prospective designed. The most frequent instrument used to screen depression was the Center for Epidemiological Studies for Depression (CES-D, n=11 studies) followed by the Beck Depression Inventory (BDI, n=6 studies) and the Hospital Anxiety and Depression Scale (HADS, n=6 studies). CES-D returned about similar prevalence of depression (median=22%, range=13-56%) with BDI (median=22%, range=17-48%) but higher than HADS (median=10%, range=1-22%). Depression was associated with several socio-demographic variables, cancer-related factors, treatment-related factors, subject psychological factors, lifestyle factors, social support and quality of life. **Conclusions:** Breast cancer survivors are at risk for depression so that detection of associated factors is important in clinical practice.

Keywords: Prevalence - depression - breast - cancer - survivors - risk factors

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Introduction

Breast cancer has one of the highest five-year survival rates among female malignancies i.e. between 80% and 95% (Coleman et al., 2011). Diagnosis of breast cancer might no longer be regarded as fatal but has been increasingly acknowledged as treatable. Nevertheless, cancer diagnosis and its treatment are recognized to be stressful times that underscored the need for clinicians to actively identify its psychological sequelae such as depression in the vulnerable patients. Early detection and treatment of depression in breast cancer sufferers not only significantly improved their quality of life but also increased their survival rates (Weinberger et al., 2010).

The period following completion of treatment and thereafter is also the transition time when women were transformed from the role of breast cancer 'patients' to become 'survivors' (Allen et al., 2009). The definition of breast cancer survivors has become broader; it used to refer to those who were cancer-free for a minimum of 5 years after their diagnoses (Odle, 2011). This has substantially

changed to encompass the period immediately after the completion of treatment, including those who were symptoms-free or had recurrence until his or her death (Odle, 2011). This is also the period whereby survivors may be at risk of developing long-term physical and psychological complications of the disease and/ or its array of treatment including mastectomy, radiotherapy and chemotherapy (Howard-Anderson et al., 2012). While data on the survivors' long-term physical health and their quality of life have considerably accumulated, greater attention to examine the psychological states of the survivors are needed to provide emotional support and care during survivorship.

Depression is often underestimated in breast cancer sufferers, with prevalence varied between 10% and 25% (Qiu et al., 2012; Popoola and Adewuya, 2012). While depression was found to be highest at diagnosis (Odle, 2011), depression during survivorship has not been studied adequately. During the follow-up care, survivors' psychological needs were often neglected (Park and Hwang, 2012). A main theme of depression among breast

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cancer survivors was the fear of breast cancer recurrence and metastasis (Pan et al., 2010). Long term effects associated with chemotherapy include infertility, sexual dysfunction, menopause-associated health problems e.g. osteoporosis and cardiovascular disease (Azim et al., 2011); all of which can be associated with depression. In addition, tamoxifen, an anti-oestrogen for treatment and prophylaxis of hormone-sensitive breast cancer has also been associated with depression (Lorizio et al., 2012). Other main concern associated with depression among survivors was body image, particularly in those who were sexually active. A related factor was the concern about physical appearance which might predict the patients' psychosocial adjustment post-surgery (Begovic-Juhant et al., 2012). The other associated factors include impending loss of support, continual follow-up medical care and problems related to adjustment to changes in their normal lives. While there were many individual studies which considered several of the factors above were conducted; to the authors' knowledge, systematic review on the psychosocial variables associated with depression during survivorship has not been performed.

Potential sources in the gap and inconsistencies of current knowledge include differences in the study methods (eg. variable measures in screening or diagnosing depression), variable definition of study populations i.e. survivors, sample selection, sampling time points, and the quality of reporting. A good review of this topic was conducted systematically (Fann et al., 2008) but did not focus on depression during survivorship; rather it looked at depression at no specific point of the disease.

These discrepancies emphasized the need to examine the current literature on depression among the breast cancer survivors. The focus on breast cancer survivors would provide a greater understanding of the frequency of depression and psychosocial characteristics of those in the period after going through a life threatening disease and its treatment. This helps to define future research priorities and sustain evidence-based psychosocial care for cancer survivors.

This paper aims to systematically review the medical literature which measured the prevalence of depression and examined the associated psychosocial and clinical factors of depression in breast cancer survivors.

Materials and Methods

The review procedure was guided by PRISMA (preferred reporting items for systematic reviews and meta- analyses) statement (Moher et al., 2009).

Search strategy

Identification of relevant studies began with systematically searches of the electronic databases through PubMed, CINAHL, PsycINFO and Ovid) with the last search being up to 15th November 2012. The search terms used were (Depression OR Dysthymia) and (Cancer OR Tumor OR Neoplasms). Searches were limited to studies published in the English language. Hand search was done according to the reference lists of all eligible studies to identify relevant studies.

Selection strategy

Title and abstract of each study were reviewed independently by two investigators (NZ & NR) to retrieve the full-text articles. To reinforce validity, the investigators then compared the papers and discrepancies resolved by consensus. Duplications or multiple publications were excluded to avoid double counting. Inclusion criteria were as follows: (i) adult patients (aged≥18); (ii) all or predominantly breast cancer survivors (survivor is defined as individual who has completed active treatment ie. surgery, adjuvant chemotherapy and radiation, and no evidence of disease recurrence); (iii) adequate data on prevalence of depression and (iv) all observational studies (cross-sectional, prospective and case-control). All methods of screening or diagnosing depression were allowed. However, quality-of-life subscale data were excluded because quality-of-life scales measure a wider construct than depression-specific rating scales. Clinical trials and experimental studies, reviews, commentaries, case reports, systematic review and meta-analyses were excluded.

One author (NZ) extracted the data from all the eligible studies, entered them into a pre-designed data extraction form. The place of study, study design, measurement tools for depression, description of the subjects, prevalence of depression and its associated factors were extracted. The results were synthesized in a narrative review.

Results

We identified 2250 titles from MEDLINE, CINAHL, PsycINFO, Ovid and reference lists hand-search strategies. Further screening for relevant articles based on title and abstract yielded 190 articles. One hundred and fifty-eight articles were excluded after reviewing and applying the inclusion criteria. Hence 32 studies were eligible for systematic review. The flowchart is shown in Figure 1.

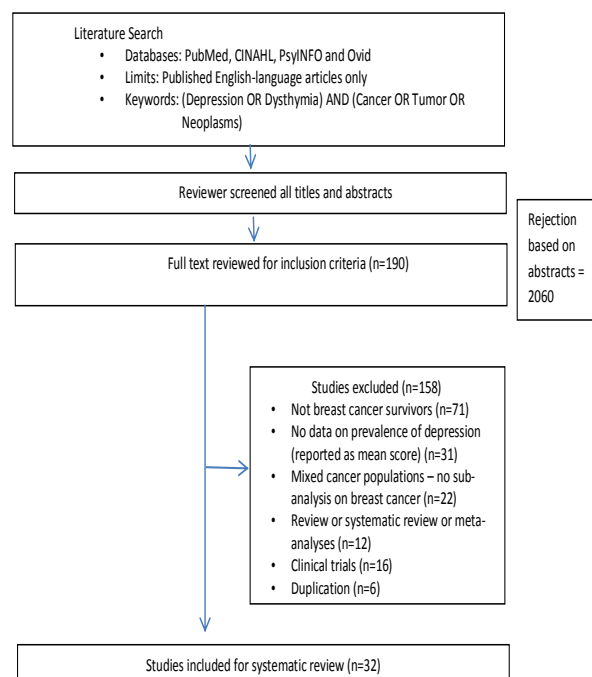


Figure 1. The Flow Diagram of Study Selection

Table 1. Descriptive Characteristics of the Included Studies (N=32)

Authors	Place of study	Study design	No. of subjects	Mean age, years	Ethnic	Married or live with partner	Stage of breast cancer	Mean duration of post-treatment, months
Green et al., 1998	Washington, USA	Cross-sectional	160	53.4	66% White	58%	I & II: 100%	6.5
Watson et al., 1999	London & Sutton, UK	Prospective survival study at 5 years	395	60	-	64%	-	60
Bower et al., 2000	LA, USA	Cross-sectional	Sample 1: 863 Sample 2: 1094	-	77% White 81% White	69% 74%	-	12 - 60
Broeckel et al., 2000	USA	Case-control	61	51.6	92% White	66%	-	40
Tangney et al., 2002	USA	Cross-sectional	117	61.5	91% Caucasian	75%	I: 48%, IIA: 32% IIB: 14%, IIIA: 4%	42
Schou et al., 2004	Oslo, Norway	Prospective study at 1 year	164	56	-	62%	0: 2%, I: 60% II: 34%, III: 4%	12
Carpenter et al., 2004	Southeastern, USA	Cross-sectional	15	46.6	73% Caucasian	93%	II or less: 66%	3 - 168
Inagaki et al., 2004	Tokyo, Japan	Cross-sectional	68	47.1	-	-	0 & I: 32%	-
Speer et al., 2005	USA	Cross-sectional	55	53.4	100% Caucasian	95%	I: 22%, IIA: 17% IIB: 11%, IIIA-C: 5%	3-192
Eversley et al., 2005	Northern California, USA	Cross-sectional	116	47	30% Caucasian 30% African America 25% Latina	33%	I: 41%, II: 29% III: 25%, IV: 4%	-
Deshields et al., 2006	Washington, USA	Prospective at 0, 3 and 6 months	84	55.6	73% Caucasian	61%	0: 10%, I: 44% II: 39%, III: 7%	6
Van Wilgen et al., 2006	Netherlands	Cross-sectional	189	55	-	-	-	12
Phillips et al., 2008	Australia	Population-based Prospective study	638	-	-	-	I: 13%, II: 38% III: 41% Unknown: 8%	98
Ullrich et al., 2008	Iowa, USA	Cross-sectional	88	63	80% Caucasian	61%		
Mehnert & Koch, 2008	Hamburg, Germany	Cross-sectional	1083	61.8		61%		
Morril et al., 2008	North Carolina, USA	Cross-sectional	161	-	85% Caucasian	73%		
Den Oudsten et al., 2009	Netherlands	Prospective at 1, 3, 6 and 12 months	144	58.7		80%		
Rabin et al., 2009	Southern Brazil	Cross-sectional	73	48	-	100%		
Chen et al., 2009	Shanghai, China	Population-based Cohort study	1400	53.7		88%		
Karakoyun-Celik et al., 2010	Turkey	Cross-sectional	120	52	-	75%		
Vahdaninia et al., 2010	Tehran, Iran	Prospective study at 3 and 18 months	99	46.4		69%		
Alexander et al., 2010	UK	Cross-sectional	200	58.1	79% White	-		
Hopwood et al., 2010	UK	Prospective study at 6, 12, 24, & 60 months	2208	56.9	-	-		
Schreiber, 2011	USA	Cross-sectional	129	56	99% Caucasian	81%		
Hill et al., 2011	UK	Prospective study at 1 year	260	-	-	-	-	12
Bower et al., 2011	LA, USA	Cross-sectional	103	51.2	86% White	79%	-	1
Begovic-Juhant et al., 2012	USA	Cross-sectional	70	49.7	65% Whites 35% African American	-	-	-
Alcalar et al., 2012	Turkey	Cross-sectional	110	48	-	86%	-	28
Hsiao et al., 2012	Taiwan	Prospective study at 2, 5, 8 and 14 months	76	50.8	-	67%	0: 15%, I: 26% II: 42%, III: 17%	14
Jang et al., 2012	Korea	Prospective study at 1 year	231	50	-	81%	0: 11%, I: 35% II: 39%, III: 12% IV: 23%	12
Khan et al., 2012	Australia	Cross-sectional	85	57	-	62%	-	26
Pumo et al., 2012	Italy	Cross-sectional	167	61	-	73%	-	Minimum 36

*SCID: Structured Interview for DSM (Diagnostic Statistical Manual); DASS: Depression, Anxiety and Distress Scale; MINI: Mini International Neuropsychiatric; CES-D: Center for Epidemiological Studies – Depression; BDI: Beck Depression Inventory Interview; HADS: Hospital Anxiety and Depression Scale; HDI: Hamilton Depression Inventory; SADS: Schedule for Affective Disorders and Schizophrenia

Table 2. Prevalence of Depression among Breast Cancer Survivors and its Associated Factors

Authors	Scale for measuring depression	Prevalence of depression	Associated factors with depression
Green et al., 1998	SCID/DSM-III-R	11% MDD	-
Watson et al., 1999	HADS	Score 8-10: 5% Score >11: 1%	Reduced chance of survival
Bower et al., 2000	CES-D	23%, 26%	Fatigue
Broeckel et al., 2000	CES-D	26%	Younger age. Unmarried. More time elapsed since diagnosis. More time elapsed since the end of chemotherapy
Tangney et al., 2002	CES-D	16.20%	Poor dietary intakes and quality
Schou et al., 2004	HADS	9%	Helpless/hopeless coping style preoperatively
Carpenter et al., 2004	CES-D	13%	Poor global sleep quality. Short sleep duration
Inagaki et al., 2004	SCID – DSMI-V	25% MDE	-
Speer et al., 2005	HDI-R	10%	Low sexual desire
Eversley et al., 2005	CES-D	52%	Low income. Mastectomy. Chemotherapy. Being Latina.
Deshields et al., 2006	CES-D	30% at Time 1 24% at Time 2 21% at Time 3	More number of children at home High anxiety levels Poor quality of life
Van Wilgen et al., 2006	CES-D	22% for breast	-
Phillips et al., 2008	HADS	3%	-
Ullrich et al., 2008	CES-D	13%	Frequent cancer discussion
Mehnert & Koch, 2008	HADS	11% moderate depression 12% high levels depression	Younger age Lower education Poor social support Fast disease progress High level of detrimental interactions
Morril et al., 2008	CES-D	15.50%	Chemotherapy Lower education Poor financial status Unmarried
Den Oudsten et al., 2009	CES-D	27.8% at 12 months	Breast conserving therapy-type of surgery Fatigue Poor sleep and rest More depressive symptoms before surgery Poor social support Higher score on neuroticism Lower score on agreeableness
Rabin et al., 2009	BDI	48%	Low physical, psychological and social relations domains of quality of life.
Chen et al., 2009	CES-D	At 18 months, 26% mild depression 12.6% clinical depression	Low income Being widowed Being divorced High co-morbidity index Low quality of life.
Karakoyun-Celik et al., 2010	BDI	19%	Unaccompanied by spouse. Requested help from a psychologist. Using an alternative treatment.
Vahdaninia et al., 2010	HADS	22.20%	Fatigue. Pain
Alexander et al., 2010	SCID	9% MDD	-
Hopwood et al., 2010	HADS	12% at 6 months 11% at 12 months 10% at 24 months 11% at 60 months	-
Schreiber, 2011	DASS	24% mild to extremely severe	-
Hill et al., 2011	SADS	16% Major Depression	Low social support
Bower et al., 2011	BDI-II	25%	Fatigue Sleep disturbance
Begovic-Juhant et al., 2012	CES-D	56%	Poor body Image Less attractiveness Less feminine
Alcalar et al., 2012	BDI	31%	Negative automatic thoughts. More cognitive errors. Low education level. Low fighting spirit. More anxious coping style
Hsiao et al., 2012	BDI-II	26% at 2 month 21% at 5 months 17% at 8 months 17% at 14 months	Lacking presence meaning of life Increase cortisol level at 2100 hours
Jang et al., 2012	MINI	16.5% at 1 year	-
Khan et al., 2012	DASS	22%	Recent diagnosis of breast cancer
Pumo et al., 2012	BDI	18%	Married. Low education level. Low quality of life.

*SCID: Structured Interview for DSM (Diagnostic Statistical Manual), DASS: Depression, Anxiety and Distress Scale, MINI: Mini International Neuropsychiatric Interview, CES-D: Center for Epidemiological Studies – Depression, BDI: Beck Depression Inventory, SADS: Schedule for Affective Disorders and Schizophrenia, HADS: Hospital Anxiety and Depression Scale, HDI: Hamilton Depression Inventory

Systematic Review of Depression in Breast Cancer Survivors et al., 2008; Chen et al., 2009), low education (Mehnert and Koch, 2008; Morrill et al., 2008; Alcalar et al., 2012) and younger age (Broeckel et al., 2000; Mehnert and Koch, 2008). Regarding marital status, being unmarried (Broeckel et al., 2000; Morrill et al., 2008), widowed or divorced (Chen et al., 2009) were significantly associated with depression although in contrast with one study which found being married (Pumo et al., 2012) was associated with depression. Deshields et al. (2006) found having more number of children at home were associated with depression. In terms of ethnic variation, only one study found that being Latina was associated with depression (Deshields et al., 2006).

Beside fatigue, other physical symptoms associated with depression were pain (Vahdaninia et al., 2010), sleep disturbance (Bower et al., 2011) and low sexual desire (Speer et al., 2005). Other illness-related factors included reduced chance of survival (Watson et al., 1999), increased cortisol level at 2100 hours (Hsiao et al., 2012) and high co-morbidity index (Chen et al., 2009). In terms of time since diagnosis, Broeckel et al. (2000) found more time elapsed since diagnosis to be associated with depression which contradicted with 'recent diagnosis of breast cancer' reported by another study (Khan et al., 2012).

Factors related to treatment of breast cancer reported to be significantly associated with depression included more time elapsed since the end of chemotherapy (Broeckel et al., 2000), receiving chemotherapy (Eversley et al., 2005; Morrill et al., 2008), had mastectomy (Eversley et al., 2005), had breast conserving type of surgery (Den Oudsten et al., 2009) and using an alternative treatment (Karakoyun-Celik et al., 2010).

The subjects' psychological factors that were associated with depression were preoperative helplessness/hopelessness (Schou et al., 2004), high anxiety levels (Deshields et al., 2006; Alcalar et al., 2012), higher neuroticism score, lower agreeableness score, more pre-operative depressive symptoms (Den Oudsten et al., 2009), poor body image, less attractiveness, less feminine (Begovic-Juhant et al., 2012), negative automatic thoughts, more cognitive errors, low fighting spirit (Alcalar et al., 2012) and lacking presence of the meaning of life (Hsiao et al., 2012).

One study found that depression was correlated with poor quality and dietary intakes (Tangney et al., 2002). Other significant lifestyle factors were poor sleep quality (Carpenter et al., 2004; Den Oudsten et al., 2009) and shorter sleep duration (Carpenter et al., 2004). Three studies found poor quality of life was significantly associated with depression (Deshields et al., 2006; Chen et al., 2009; Rabin et al., 2009) in which Rabin et al. (2009) found the significance was confined to the domains of physical, psychological and social relations (Rabin et al., 2009). Social support was examined in several studies which report a significant association with depression i.e. poor social support (Mehnert and Koch, 2008; Den Oudsten et al., 2009), being unaccompanied by spouse and requested for help from psychologist (Karakoyun-Celik et al., 2010). Other factors included having frequent cancer discussion and high level of detrimental interactions (Ulrich et al., 2008).

Methods of studies

The study design and characteristics of the breast cancer survivors are listed in Table 1. Most of the studies were conducted in USA (thirteen), followed by in Europe (five) and four studies from United Kingdom. Seven studies were conducted in Asian countries (Inagaki et al., 2004; Chen et al., 2009; Karakoyun-Celik et al., 2010; Vahdaninia et al., 2010; Alcalar et al., 2012; Hsiao et al., 2012; Jang et al., 2012). Nineteen of the studies were cross-sectional design and twelve prospective studies. Eight distinct methods were used to diagnose depression in the 32 included studies. The most frequent methods used were the dichotomous approach using patient-rated scales. Eleven studies used Center for Epidemiological Studies – depression (CES-D), 6 studies used Beck Depression Inventory (BDI) and 6 studies used Hospital Anxiety and Depression Scale (HADS). On the other hand, 5 studies diagnosed depression by using a structured clinical interview. Each of the studies conducted in the Asian countries used different type of scales for diagnosis.

Subjects

A total of 10,826 breast cancer survivors were included in the 32 studies (median sample size=129 patients, range=15-2208 patients). The mean age of the subjects ranged from 47-63 years. In studies that reported ethnicity and marital status, majority of those in the western studies were Caucasians or white (median=80%, range: 30-100%) and about three-quarter of the subjects were married (median=73%, range=33-100%). Most breast cancer survivors had stage 0-II during the diagnosis and mean/median duration post-treatment was between 1-98 months.

Prevalence of depression

Depression was reported as a categorical variable (as 'present' or 'absent') according to either a rating scale score or clinical judgment. The prevalence of depression in breast cancer survivors varied greatly from as low as 1% (Watson et al., 1999) to as high as 56% (Begovic-Juhant et al., 2012) as shown in Table 2. The prevalence of depression from the Asian studies (Inagaki et al., 2004; Karakoyun-Celik et al., 2010; Vahdaninia et al., 2010; Chen et al., 2009; Alcalar et al., 2012; Hsiao et al., 2012; Jang et al., 2012) reported a narrower range of 12.5-31% (median=19%). Studies which used CES-D reported about similar prevalence of depression (median=22%, range=13-56%) with BDI (median=22%, range=17-48%) but higher than HADS (median=10%, range=1-22%). Also, studies which used diagnostic measures found a similar prevalence of depression (median=16.25%, range=9-25%) while those used self-reported/screening questionnaires reported a wider range of prevalence (1-56%).

Factors associated with depression

Factors that were found to be significantly associated with depression in breast cancer survivors are presented in Table 2. Depression was most frequently associated with fatigue (Bower et al., 2000; 2011; Den Oudsten et al., 2009; Vahdaninia et al., 2010) followed by lower income/poor financial status (Eversley et al., 2005; Morrill

Discussion

The prevalence of depression among breast cancer survivors varies across the extreme of 1-56% according to how it was defined. The range of prevalence of depression reported by Fann et al. (2008) in a review of breast cancer population of any phases of treatment was rather narrower ie. 10-25%. The study populations in this systematic review were rather homogenous in terms of their mean age, marital status, stage of breast cancer and have completed their treatment. However the tool for screening/ diagnosing depression varies from one study to another. CES-D returned about similar prevalence of depression (median=22%, range=13-56%) with BDI (median=22%, range=17-48%) while HADS returned a lower prevalence (median=10%, range=1-22%). CES-D has been reported as a valid and reliable tool to screen depression in breast cancer patients (Hann et al., 1999) and demonstrates the same general structure of responses in different ethnic groups (Makambi et al., 2009). Similarly BDI and HADS are other useful screening tools for depression in cancer patients (Wang et al., 2011; Warmenhoven et al., 2012). However these are symptom scales that were not designed to diagnose Major Depression. The use of diagnostic interview scales such as SCID, SADS and MINI in the studies included in this systematic review yielded prevalence of depression between 9-25%. Even though HADS seems to detect about similar prevalence of depression as compared to the diagnostic tools, it is not recommended to be used for case-finding instrument but suitable in screening programme (Mitchel et al., 2010). Analysis of the items in HADS-depression used in cancer patients, combination of "feeling down, depressed or hopeless" with "thoughts that would be better off dead, little interest or pleasure in doing things" gave high sensitivity but low specificity (Mitchell et al., 2012).

The prevalence of depression in breast cancer survivors reported in the Asian studies varied 12.5-31% (median=19%). The prevalence was not much different from those found in the western countries. Two of the studies used DSM criteria to diagnose Major Depression and five studies conducted in China, Turkey, Iran and Taiwan used self-report screening tools.

The factors associated with depression varied from one study to another depending on the primary objectives of the study. Some studies have reported correlation between psychosocial factors such as being women, single or divorcee, lower education, low income, poor social support with depression. Other study reported no association between socio-demographic variables and depression (Karakoyun-Celik et al., 2010). Illness factors such as pain and physical impairment have been associated with depression in medically ill patients (Johnson et al., 2006). Similarly pain could predict depression in breast cancer survivors (Vahdaninia et al., 2010). Common physical symptom in cancer patients such as fatigue which can be symptom of the disease progression but also the common adverse effects of radiotherapy or chemotherapy was frequently reported to be associated with depression (Bower et al., 2000; 2011; Den Oudsten et al., 2009; Vahdaninia et al., 2010). In addition, mastectomy can

cause scars and disfigurement which can lead to perception of becoming less attractive, less feminine and poor body image which have been associated with depression (Begovic-Juhant et al., 2012). Alcalar et al. (2012) reported the association between negative automatic thoughts and cognitive errors with depression in women in Turkey who had completed breast cancer treatment. Helplessness/hopelessness was more often expressed in severely depressed cohort that can lead to negative effect on coping with cancer (Schou et al., 2004).

There were several limitations to our review of these studies. While we attempted to minimize publication bias by searching multiple databases through electronic and hand search, we limited our analysis to studies in English and did not look for the unpublished papers. However the studies were from various parts of the regions including Asia-pacific countries though more numbers representing United States. There may be some cultural diversity within this region but we did not intend to examine on cultural issues. This is a systematic review of observational studies; therefore we could not ensure that all potential confounders were controlled for in those studies.

In conclusion, despite these limitations, the data suggest that breast cancer survivors are at risk for depression and identification of related factors (socio-demographic, illness, lifestyles, treatment and psychological) is important for practicing clinicians during routine psycho-oncology care. There may be a need for pharmacotherapy (Ng et al., 2011) and/or psychological interventions (Zainal et al., 2012).

For future research, these data implied that authors should attempt to use consistent screening tools so that cross-study comparisons evaluate similar definition of depression. In addition, more studies should include diagnostic assessments for depression. We hope the data from this review will help mental health professionals and hospital administrators to consider the clinical settings to effectively treat the psychological problems of cancer patients and to define future research priorities and sustain evidence-based psychosocial care for breast cancer survivors.

References

- Alcalar N, Ozkan S, Kucucuk S, et al (2012). Association of coping style, cognitive errors and cancer-related variables with depression in women treated for breast cancer. *Jpn J Clin Oncol*, **42**, 940-7.
- Alexander S, Palmer C, Stone PC (2010). Evaluation of screening instruments for depression and anxiety in breast cancer survivors. *Breast Cancer Res Treat*, **122**, 573-8.
- Allen JD, Savadatti S, Levy AG (2009). The transition from breast cancer 'patient' to 'survivor'. *Psychooncology*, **18**, 71-8.
- Azim HA Jr, de Azambuja E, Colozza M, et al (2011). Long-term toxic effects of adjuvant chemotherapy in breast cancer. *Ann Oncol*, **22**, 1939-47
- Begovic-Juhant A, Chmielewski A, Iwuagwu S, et al (2012). Impact of body image on depression and quality of life among women with breast cancer. *J Psychosoc Oncol*, **30**, 446-60.
- Bower JE, Ganz PA, Desmond KA, et al (2000). Fatigue in breast cancer survivors: occurrence, correlates, and impact

- on quality of life. *J Clin Oncol*, **18**, 743-53.
- Bower JE, Ganz PA, Irwin MR, et al (2011). Inflammation and behavioral symptoms after breast cancer treatment: do fatigue, depression, and sleep disturbance share a common underlying mechanism? *J Clin Oncol*, **29**, 3517-22.
- Broeckel JA, Jacobsen PB, Balducci L, et al (2000). Quality of life after adjuvant chemotherapy for breast cancer. *Breast Cancer Res Treat*, **62**, 141-50.
- Carpenter JS, Elam JL, Ridner SH, et al (2004). Sleep, fatigue, and depressive symptoms in breast cancer survivors and matched healthy women experiencing hot flashes. *Oncol Nurs Forum*, **31**, 5591-8.
- Chen X, Zheng Y, Zheng W, et al (2009). Prevalence of depression and its related factors among Chinese women with breast cancer. *Acta Oncol*, **48**, 1128-36.
- Coleman MP, Forman D, Bryant H, et al (2011). Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995-2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. *Lancet*, **377**, 127-38.
- Den Oudsten BL, Van Heck GL, Van der Steeg AF, et al (2009). Predictors of depressive symptoms 12 months after surgical treatment of early-stage breast cancer. *Psychooncology*, **18**, 1230-7.
- Deshields T, Tibbs T, Fan MY, Taylor M (2006). Differences in patterns of depression after treatment for breast cancer. *Psychooncology*, **15**, 398-406.
- Eversley R, Estrin D, Dibble S, et al (2005). Post-treatment symptoms among ethnic minority breast cancer survivors. *Oncol Nurs Forum*, **32**, 250-6.
- Fann JR, Thomas-Rich AM, Katon WJ, et al (2008). Major depression after breast cancer: a review of epidemiology and treatment. *Gen Hosp Psychiatry*, **30**, 112-26.
- Green BL, Rowland JH, Krupnick JL, et al (1998). Prevalence of posttraumatic stress disorder in women with breast cancer. *Psychosomatics*, **39**, 102-11.
- Hann D, Winter K, Jacobsen P (1999). Measurement of depressive symptoms in cancer patients: evaluation of the Center for Epidemiological Studies Depression Scale (CES-D). *J Psychosom Res*, **46**, 437-43.
- Hill J, Holcombe C, Clark L, et al (2011). Predictors of onset of depression and anxiety in the year after diagnosis of breast cancer. *Psychol Med*, **41**, 1429-36.
- Hopwood P, Sumo G, Mills J, et al (2010). The course of anxiety and depression over 5 years of follow-up and risk factors in women with early breast cancer: results from the UK Standardisation of Radiotherapy Trials (START). *Breast*, **19**, 84-91.
- Howard-Anderson J, Ganz PA, Bower JE, Stanton AL (2012). Quality of life, fertility concerns, and behavioral health outcomes in younger breast cancer survivors: a systematic review. *J Natl Cancer Inst*, **104**, 386-405.
- Hsiao FH, Chang KJ, Kuo WH, et al (2013). A longitudinal study of cortisol responses, sleep problems, and psychological well-being as the predictors of changes in depressive symptoms among breast cancer survivors. *Psychoneuroendocrinology*, **38**, 356-66.
- Inagaki M, Matsuoka Y, Sugahara Y, et al (2004). Hippocampal volume and first major depressive episode after cancer diagnosis in breast cancer survivors. *Am J Psychiatry*, **161**, 2263-70.
- Jang JE, Kim SW, Kim SY, et al (2012). Religiosity, depression, and quality of life in Korean patients with breast cancer: a 1-year prospective longitudinal study. *Psychooncology*, **22**, 922-9.
- Johnson JL, Minarik PA, Nystrom KV, et al (2006). Poststroke depression incidence and risk factors: an integrative literature
- Karakoyun-Celik O, Gorken I, Sahin S, et al (2010). Depression and anxiety levels in woman under follow-up for breast cancer: relationship to coping with cancer and quality of life. *Med Oncol*, **27**, 108-13.
- Khan F, Amatya B, Pallant JF, Rajapaksa I (2012). Factors associated with long-term functional outcomes and psychological sequelae in women after breast cancer. *Breast*, **21**, 314-20.
- Lorizio W, Wu AH, Beattie MS, et al (2012). Clinical and biomarker predictors of side effects from tamoxifen. *Breast Cancer Res Treat*, **132**, 1107-18.
- Makambi KH, Williams CD, Taylor TR, et al (2009). An assessment of the CES-D scale factor structure in black women: The Black Women's Health Study. *Psychiatry Res*, **168**, 163-70.
- Mehnert A, Koch U (2008). 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*, **64**, 383-91.
- Mitchell AJ, Lord K, Symonds P (2012). Which symptoms are indicative of DSMIV depression in cancer settings? An analysis of the diagnostic significance of somatic and non-somatic symptoms. *J Affect Disord*, **138**, 137-48.
- Mitchell AJ, Meader N, Symonds P (2010). Diagnostic validity of the Hospital Anxiety and Depression Scale (HADS) in cancer and palliative settings: a meta-analysis. *J Affect Disord*, **126**, 335-48.
- Moher D, Liberati A, Tetzlaff J, Altman DG (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*, **339**, 2535.
- Morrill EF, Brewer NT, O'Neill SC, et al (2008). The interaction of post-traumatic growth and post-traumatic stress symptoms in predicting depressive symptoms and quality of life. *Psychooncology*, **17**, 948-53.
- Ng CG, Boks MP, Zainal NZ, de Wit NJ (2011). The prevalence and pharmacotherapy of depression in cancer patients. *J Affect Disord*, **131**, 1-7.
- Odle TG (2011). Breast cancer survivorship and surveillance. *Radiol Technol*, **83**, 63-87.
- Park BW, Hwang SY (2012). Unmet needs of breast cancer patients relative to survival duration. *Yonsei Med J*, **53**, 118-25.
- Pan L, Han Y, Sun X, et al (2010). FDG-PET and other imaging modalities for the evaluation of breast cancer recurrence and metastases: a meta-analysis. *J Cancer Res Clin Oncol*, **136**, 1007-22.
- Phillips KA, Osborne RH, Giles GG, et al (2008). Psychosocial factors and survival of young women with breast cancer: a population-based prospective cohort study. *J Clin Oncol*, **26**, 4666-71.
- Popoola AO, Adewuya AO (2012). Prevalence and correlates of depressive disorders in outpatients with breast cancer in Lagos, Nigeria. *Psychooncology*, **21**, 675-9.
- Pumo V, Milone G, Iacono M, et al (2012). Psychological and sexual disorders in long-term breast cancer survivors. *Cancer Manag Res*, **4**, 61-5.
- Qiu J, Yang M, Chen W et al (2012). Prevalence and correlates of major depressive disorder in breast cancer survivors in Shanghai, China. *Psychooncology*, **21**, 1331-7.
- Rabin EG, Heldt E, Hirakata VN, et al (2009). Depression and perceptions of quality of life of breast cancer survivors and their male partners. *Oncol Nurs Forum*, **36**, 153-8.
- Schou I, Ekeberg O, Ruland CM, et al (2004). Pessimism as a predictor of emotional morbidity one year following breast cancer surgery. *Psychooncology*, **13**, 309-20.

- Schreiber JA (2011). Image of God: effect on coping and psychospiritual outcomes in early breast cancer survivors. *Oncol Nurs Forum*, **38**, 293-301.
- Speer JJ, Hillenberg B, Sugrue DP, et al (2005). Study of sexual functioning determinants in breast cancer survivors. *Breast J*, **11**, 440-7.
- Tangney CC, Young JA, Murtaugh MA, et al (2002). Self-reported dietary habits, overall dietary quality and symptomatology of breast cancer survivors: a cross-sectional examination. *Breast Cancer Res Treat*, **71**, 113-23.
- Ullrich PM, Rothrock NE, Lutgendorf SK, et al J (2008). Adjustment and discussion of cancer: A comparison of breast and prostate cancer survivors. *Psychol Health*, **23**, 391-406.
- Vahdaninia M, Omidvari S, Montazeri A (2010). What do predict anxiety and depression in breast cancer patients? A follow-up study. *Soc Psychiatry Psychiatr Epidemiol*, **45**, 355-61.
- Van Wilgen CP, Dijkstra PU, Stewart RE, et al (2006). 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*, **47**, 465-70.
- Wang GL, Hsu SH, Feng AC, et al (2011). The HADS and the DT for screening psychosocial distress of cancer patients in Taiwan. *Psychooncology*, **20**, 639-46.
- Warmenhove F, Van Rijswijk E, Engels Y, et al (2012). The Beck Depression Inventory (BDI-II) and a single screening question as screening tools for depressive disorder in Dutch advanced cancer patients. *Support Care Cancer*, **20**, 319-24.
- Watson M, Haviland JS, Greer S, et al (1999). Influence of psychological response on survival in breast cancer: a population-based cohort study. *Lancet*, **354**, 1331-6.
- Weinberger T, Forrester A, Markov D, et al (2010). Women at a dangerous intersection: diagnosis and treatment of depression and related disorders in patients with breast cancer. *Psychiatr Clin North America*, **33**, 409-22.
- Zainal NZ, Booth S, Huppert FA (2012). The efficacy of mindfulness-based stress reduction on mental health of breast cancer patients: a meta-analysis. *Psychooncology*, [Epub ahead of print].