RESEARCH ARTICLE

Assessment of Depression and Anxiety in Breast Cancer Patients: Prevalence and Associated Factors

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Abstract

   Introduction: Having breast cancer or receiving treatment has been seen as a traumatic experience for women due to its impacts on their self-image and sexual relationship, and may lead to an psychological reactions such as denial, anger, or intense fear toward their disease and treatment process. Also many of breast cancer patients have psychiatric morbidities such as depression and anxiety. **Purpose:** The purpose of this study was to assess the prevalence and associated factors of depression and anxiety in breast cancer patients, in order to identify independent predictors of mental health disorders risk. **Material and Methods:** A cohort of 152 breast cancer patients who were attending an outpatient oncology department was recruited. Data were collected with a structured questionnaire consisted by social, clinical and demographic information and PHQ-2 and GAD-2 scales. **Results:** The mean age of the patients was 53.25 years (SD=12.10), 69.7% of the patients underwent mastectomy and 30.3% ongectomy. Chemotherapy received 46.1% of patients as adjuvant therapy, 15.8% radiotherapy and 38.2% received both chemotherapy and radiotherapy. A large percentage found to be classified as depressed (38.2%) and anxious (32.2%) and factors that found to be associated were age, marital status, educational level, stage of cancer from univariate analyses and place of residence, religion, symptoms burden from multivariate analysis (for depression and anxiety). **Conclusions:** Breast cancer patients are in high risk for developing psychiatric disorders such as depression and anxiety. Being rural resident, non-Orthodox Christian and experiencing extend symptom burden can be predicting factors associated with depression and anxiety in breast cancer patients.

Keywords: Psychological distress- depression- anxiety- breast cancer- predictors

Introduction

   Breast cancer is the most common cancer type among females worldwide, as 1 in 8 women will be diagnosed with the disease in their lifetime (Christensen and Marck, 2017). The problems experienced by survivors include physical symptoms, psychological reactions and existential concerns, which potentially disrupt their well-being (Würtzen et al., 2013). The overall prevalence of depression in oncology patients remains unclear, and according to previous studies the prevalence is reported to be between 0% and 58%. The wide range of rates may be due to several factors, including: (i) the use of different instruments to assess depression with different psychometric properties, (ii) the use of different criteria for defining depression, and (iii) differences between included cancer populations with respect to cancer type, stage and treatment modality (Krebber et al., 2014). In patients with a prognosis of six months or less, prevalence of depression according to the ICD-10 diagnostic criteria was 22%. Also, studies

focusing on psychological distress during the clinical course of the disease showed a significant increase in psychological distress during the last two to three months before death and especially in the last month of life (Fafouti et al., 2010).

   Emotional distress in cancer patients is associated with a reduction in overall quality of life among patients, and has a negative impact on compliance levels with medical treatment, and carries an elevated risk of mortality, so emotional distress is recognized as the sixth vital sign in cancer care (Linden et al., 2012). Moreover, patients with cancer and co morbid depression have worse anxiety, pain, fatigue, and functioning than do other patients with cancer, and are more likely to have suicidal thoughts (Walker et al., 2014). Despite the effect distress has on daily functioning, distress in cancer patients is often overlooked and under-treated (Ng et al., 2017).

   Having breast cancer or receiving treatment has been seen as a traumatic experience to women due to its impacts on their self-image and sexual relationship,

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so most of the breast cancer patients have psychological reactions such as denial, anger, or intense fear toward their disease and treatment process, and many of have psychiatric morbidities (Lueboonthavatchai, 2007). Many of the breast cancer patients experience fatigue, depression, and/or anxiety months to years after their breast cancer diagnosis with these symptoms being associated with greater disability and a poorer quality of life (Rogers et al., 2017). Depressive disorders may include major depressive disorder, dysthymic disorder, adjustment disorder with depressive mood and mixed depressive and anxious mood disorders. Other commonly encountered psychiatric disorders in breast cancer patients include anxiety disorders including generalized anxiety disorder, post-traumatic stress syndrome and adjustment disorder with anxious mood (Fiorentino et al., 2011). Because of the unique psychosocial, medical and hormonal factors that may influence mood in breast cancer patients, epidemiological and treatment data on depression from other populations cannot be assumed to generalize to this population (Fann et al., 2008).

The prevalence of depression is high during the first year after breast cancer diagnosis, and according to a systematic review by Zainal et al., the three studies with the highest prevalence of depression included patients in their first year after diagnosis (Maass et al., 2015). One study demonstrated in a very large sample of cancer patients that the prevalence of depression among breast cancer survivors was about 32.8%. It has also been reported that 40% of the patients who experience disease recurrence would suffer from anxiety and depression (Vahdaninia et al., 2010). In 227 advanced breast cancer, Grabsch et al. found a 42% rate of psychiatric disorders and 35.7% of these had depression or anxiety or both. Minor depression was found in 25.6%, major depression in 7% and anxiety disorder in 6.2% (Reich et al., 2008).

In patients with breast cancer, the skills and strengths to aid coping and recovery from problems and challenges caused by the disease are associated with multiple variables, which may be evaluated by characteristics related to the patient, stage of the disease and treatment, and environment (Karakoyun-Celik et al., 2010).

Risk factors for anxiety and depression in women with breast cancer include: a past history of anxiety or depressive disorder, younger age at diagnosis, poor social support, burdensome somatic symptoms, currently undergoing active cancer treatment, specific drug treatments (Beatty and Kissane, 2017), worries regarding fear of death and disease recurrence, altered body image (Vahdaninia et al., 2010), alteration of femininity, sexuality and attractiveness (Reich et al., 2008). Adjuvant chemotherapy may lead to an increased risk of depression, anxiety, or both during but not after treatment (Burgess et al., 2005).

Regarding treatment options, psychological interventions such as cognitive behavioral therapy, supportive-expressive group therapy and yoga have demonstrated positive effects on breast cancer patients, while classic pharmacotherapy, such as antidepressants, should be reserved for cases of true depression (Pinto and de Azambuja, 2011).

The purpose of this study was to assess the prevalence and associated factors of depression and anxiety in breast cancer patients, in order to identify independent predictors of mental health disorders risk.

Materials and Methods

Study Design and Sample

A descriptive, cross-sectional study was conducted between 1st May and 31st July 2017 in an oncology public hospital of Greece. The sample consisted of 170 randomly selected breast cancer patients who came for follow-up in the oncology outpatient department and met the inclusion criteria. All study participants were women who survived breast cancer and they had been treated with different oncological therapies. The inclusion criteria were the following: (1) woman, 18 or more years of age, (2) histologically documented diagnosis of breast cancer, (3) no history of prior mental disorder and dementia, (4) no abuse of alcohol or drugs, (5) adequate knowledge of the Greek language and satisfactory level of communication, and (6) consent to participate in the study. Out of 170 breast cancer patients, 152 agreed to participate in the study (response rate = 89.4%). After an official letter of cooperation, the study protocol was approved by the Ethics Committee and the Scientific Council of the hospital where the study was performed. Prior to the interview, all participants were given explanation of the study purpose and they signed an informed consent form. The research was executed following the principles of confidentiality, anonymity and informed consent, as outlined by the Declaration of Helsinki and its subsequent revisions.

Assessment Instruments

Data was collected by face to face interviews using a structured and pretested questionnaire which was specifically designed for the study. In the questionnaire two sections were included:

A) Individual characteristics. The basics sociodemographic (age, place of residence, marital status, number of children, educational level, religion), and clinical (surgical therapy, adjuvant therapy, using Tamoxifen, stage of breast cancer, current activity - symptoms burden) data were collected.

B) PHQ-2 and GAD-2 scales. The Patient Health Questionnaire-2 (PHQ-2) and the Generalized Anxiety Disorder-2 (GAD-2) questionnaire were produced as ultra-brief screening instruments for depression and anxiety, suitable for use in epidemiological studies. The PHQ-2 includes two questions and it was found to have good sensitivity and specificity for detecting depressive disorders (Kroenke et al., 2003). Likewise, the GAD-2 questionnaire which comprises two questions appears to have acceptable accuracy for detecting generalized anxiety, panic, social anxiety and post-traumatic stress disorder (Kroenke et al., 2007). In both questionnaires, each question requires respondents to rate on a four-point scale ranging from "0 = not at all" to "3 = nearly every day". PHQ-2 and GAD-2 total scores are calculated by adding the two questions score, resulting in a range from 0 to 6 for each questionnaire, with higher score indicative of higher

Psychological Distress in Breast Cancer

Table 1. Breast Cancer Patients' Characteristics (n=152)

Characteristics	n	(%)
Age (years)		
< 40	20	(13.2%)
40 - 49	41	(27.0%)
50 - 59	44	(28.9%)
60 - 69	35	(23.0%)
≥ 70	12	(7.9%)
mean ± sd	53.25 ± 12.10	
Place of residence		
Urban	87	(57.2%)
Semi-urban	36	(23.7%)
Rural	29	(19.1%)
Marital status		
Married	84	(55.3%)
Single	24	(15.8%)
Divorced	26	(17.1%)
Widowed	18	(11.8%)
Number of children		
0	32	(21.1%)
1 - 2	85	(55.9%)
≥ 3	35	(23.0%)
Educational level (years)		
≤ 6	11	(7.2%)
9	26	(17.1%)
12	61	(40.1%)
> 12	54	(35.5%)
Religion		
Christian Orthodox	135	(88.8%)
Christian Catholic/Protestant	9	(5.9%)
Muslim	2	(1.3%)
Other	6	(3.9%)
Surgical therapy		
Mastectomy	106	(69.7%)
Ongectomy	46	(30.3%)
Adjuvant therapy		
Chemotherapy and Radiotherapy	58	(38.2%)
Chemotherapy	70	(46.1%)
Radiotherapy	24	(15.8%)
Using Tamoxifen		
Yes	87	(57.2%)
No	65	(42.8%)
Stage of breast cancer		
I	26	(17.1%)
II	43	(28.3%)
III	67	(44.1%)
IV	16	(10.5%)
Current activity - Symptoms burden		
Normal activity, no symptoms (very good level)	49	(32.2%)
Some symptoms, do not require bed rest during the day (good level)	54	(35.5%)
Require bed rest less than 50% of the day (moderate level)	28	(18.4%)
Require bed rest more than 50% of the day (bad level)	16	(10.5%)
Cannot get out of bed (very bad level)	5	(3.3%)

mental health disorder. According to receiver-operating characteristic curve analysis, the optimal cutpoint is ≥ 3 on both the PHQ-2 and GAD-2 scales Löwe et al., 2010; Kroenke et al., 2010).

Statistical Analyses

Means and standard deviations for continuous data and frequencies and percentages for categorical data are presented to demonstrate breast cancer patients' characteristics (independent variables). The occurrences of depression and anxiety were used as the outcomes (dependent variables) of the under research correlations. Odds ratio with 95% confidence interval was used as measure of association. Associations between potential prognostic determinants and outcomes were examined using univariate logistic regression analysis. Predictors univariately associated with outcome (p-value < 0.10) were included in a multivariate logistic regression model. The fit of the multivariate model was assessed by the Hosmer-Lemeshow goodness-of-fit test. All reported p-values were two-tailed, and a p-value under 0.05 was considered statistically significant. Statistics of the research's empirical data were processed with IBM SPSS for Windows (version 21.0, SPSS Inc., Chicago, IL, USA).

Results

Sociodemographic and Clinical Characteristics

A total of 152 breast cancer patients were included in this study. The mean age of the patients was 53.25 years (SD=12.10) and the majority of them were found in the age range of 40-59 (55.9%). Overall, 57.2% and 23.7% respondents were urban and semi-urban residents, respectively. Most respondents were married (55.3%) and had 1 to 2 children (55.9%). Over 9 years of education was completed by 75.6% of patients. The majority of the study participants were Orthodox Christianity followers (88.8%). As far as the clinical characteristics of the sample, 69.7% of the patients underwent mastectomy and 30.3% ongectomy. Chemotherapy received 46.1% of patients as adjuvant therapy, 15.8% radiotherapy and 38.2% received both chemotherapy and radiotherapy. Proportion of using "Tamoxifen" was 57.2%. Majority of the respondents were in the second (28.3%) or third (44.1%) stage of

Table 2. Prevalence of Depression and Anxiety in Breast Cancer Patients (n=152)

Scales	n	(%)
PHQ-2 (total score)		
≥ 3 (presence of depression)	58	(38.2%)
< 3 (absence of depression)	94	(61.8%)
mean ± sd	2.05 ± 1.74	
GAD-2 (total score)		
≥ 3 (presence of anxiety)	49	(32.2%)
< 3 (absence of anxiety)	103	(67.8%)
mean ± sd	1.97 ± 1.85	

PHQ, Patient Health Questionnaire; GAD, Generalized Anxiety Disorder

Table 3. Association between Characteristics and Depression in Breast Cancer Patients

Characteristics	Presence of Depression		Absence of Depression		COR (95% CI)	AOR (95% CI)
	n	(%)	n	(%)		
Age (years)						
< 40	5	(25.0%)	15	(75.0%)	1[a]	
40 - 49	18	(43.9%)	23	(56.1%)	2.35 (0.72, 7.68)	
50 - 59	13	(29.5%)	31	(70.5%)	1.26 (0.38, 4.18)	
60 - 69	15	(42.9%)	20	(57.1%)	2.25 (0.67, 7.57)	
≥ 70	7	(58.3%)	5	(41.7%)	4.20 (0.91, 19.40)**	
Place of residence						
Urban	31	(35.6%)	56	(64.4%)	1[a]	1[a]
Semi-urban	11	(30.6%)	25	(69.4%)	0.80 (0.35, 1.83)	0.92 (0.37, 2.29)
Rural	16	(55.2%)	13	(44.8%)	2.22 (0.95, 5.22)**	2.56 (1.02, 6.40)*
Marital status						
Married	24	(28.6%)	60	(71.4%)	1[a]	
Single	11	(45.8%)	13	(54.2%)	2.12 (0.83, 5.37)	
Divorced	13	(50.0%)	13	(50.0%)	2.50 (1.01, 6.17)*	
Widowed	10	(55.6%)	8	(44.4%)	3.13 (1.10, 8.87)*	
Number of children						
0	14	(43.8%)	18	(56.3%)	1[a]	
1 - 2	32	(37.6%)	53	(62.4%)	0.78 (0.34, 1.77)	
≥ 3	12	(34.3%)	23	(65.7%)	0.67 (0.25, 1.80)	
Educational level (years)						
≤ 9	20	(54.1%)	17	(45.9%)	1[a]	
> 9	38	(33.0%)	77	(67.0%)	0.42 (0.20, 0.89)*	
Religion						
Christian Orthodox	44	(32.6%)	91	(67.4%)	1[a]	1[a]
Non - Christian Orthodox	14	(82.4%)	3	(17.6%)	9.65 (2.64, 35.34)*	6.80 (1.72, 26.90)*
Surgical therapy						
Mastectomy	41	(38.7%)	65	(61.3%)	1[a]	
Ongectomy	17	(37.0%)	29	(63.0%)	0.93 (0.46, 1.90)	
Adjuvant therapy						
Chemotherapy and Radiotherapy	21	(36.2%)	37	(63.8%)	1[a]	
Chemotherapy	26	(37.1%)	44	(62.9%)	1.04 (0.51, 2.14)	
Radiotherapy	11	(45.8%)	13	(54.2%)	1.49 (0.57, 3.91)	
Using Tamoxifen						
Yes	37	(42.5%)	50	(57.5%)	1[a]	
No	21	(32.3%)	44	(67.7%)	0.65 (0.33, 1.26)	
Stage of breast cancer						
I	8	(30.8%)	18	(69.2%)	1[a]	
II	13	(30.2%)	30	(69.8%)	0.98 (0.34, 2.81)	
III	26	(38.8%)	41	(61.2%)	1.43 (0.54, 3.75)	
IV	11	(68.8%)	5	(31.3%)	4.95 (1.29, 19.01)*	
Current activity - Symptoms burden						
Good / Very good level	30	(29.1%)	73	(70.9%)	1[a]	1[a]
Moderate level	13	(46.4%)	15	(53.6%)	2.11 (0.90, 4.96)**	2.14 (0.86, 5.29)**
Bad / Very bad level	15	(71.4%)	6	(28.6%)	6.08 (2.16, 17.17)*	3.75 (1.20, 11.76)*

NB, [a]Indicates reference category; *, p<0.05; **, p<0.10; COR, Crude Odds Ratio; AOR, Adjusted Odds Ratio; Hosmer-Lemeshow test, p;0.753, Adjusted Nagelkerke R^2, 22.6%, Overall Predictive Ability; 71.7%

Table 4. Association between Characteristics and Anxiety in Breast Cancer Patients

Characteristics	Presence of Anxiety		Absence of Anxiety		COR (95% CI)	AOR (95% CI)
	n	(%)	n	(%)		
Age (years)						
< 40	4	(20.0%)	16	(80.0%)	1ᵃ	
40 - 49	18	(43.9%)	23	(56.1%)	3.13 (0.89, 11.01)**	
50 - 59	11	(25.0%)	33	(75.0%)	1.33 (0.37, 4.85)	
60 - 69	10	(28.6%)	25	(71.4%)	1.60 (0.43, 5.98)	
≥ 70	6	(50.0%)	6	(50.0%)	4.00 (0.83, 19.33)**	
Place of residence						
Urban	24	(27.6%)	63	(72.4%)	1ᵃ	1ᵃ
Semi-urban	10	(27.8%)	26	(72.2%)	1.01 (0.42, 2.40)	1.32 (0.49, 3.56)
Rural	15	(51.7%)	14	(48.3%)	2.81 (1.18, 6.69)*	3.77 (1.41, 10.07)*
Marital status						
Married	21	(25.0%)	63	(75.0%)	1ᵃ	
Single	10	(41.7%)	14	(58.3%)	2.14 (0.83, 5.54)	
Divorced	11	(42.3%)	15	(57.7%)	2.20 (0.88, 5.53)**	
Widowed	7	(38.9%)	11	(61.1%)	1.91 (0.66, 5.56)	
Number of children						
0	12	(37.5%)	20	(62.5%)	1ᵃ	
1 - 2	25	(29.4%)	60	(70.6%)	0.69 (0.30, 1.63)	
≥ 3	12	(34.3%)	23	(65.7%)	0.87 (0.32, 2.36)	
Educational level (years)						
≤ 9	17	(45.9%)	20	(54.1%)	1ᵃ	
> 9	32	(27.8%)	83	(72.2%)	0.45 (0.21, 0.97)*	
Religion						
Christian Orthodox	35	(25.9%)	100	(74.1%)	1ᵃ	1ᵃ
Non - Christian Orthodox	14	(82.4%)	3	(17.6%)	13.33 (3.62, 49.17)*	9.70 (2.37, 39.69)*
Surgical therapy						
Mastectomy	36	(34.0%)	70	(66.0%)	1ᵃ	
Ongectomy	13	(28.3%)	33	(71.7%)	0.77 (0.36, 1.63)	
Adjuvant therapy						
Chemotherapy and Radiotherapy	20	(34.5%)	38	(65.5%)	1ᵃ	
Chemotherapy	22	(31.4%)	48	(68.6%)	0.87 (0.42, 1.83)	
Radiotherapy	7	(29.2%)	17	(70.8%)	0.78 (0.28, 2.20)	
Using Tamoxifen						
Yes	31	(35.6%)	56	(64.4%)	1ᵃ	
No	18	(27.7%)	47	(72.3%)	0.69 (0.34, 1.39)	
Stage of breast cancer						
I	7	(26.9%)	19	(73.1%)	1ᵃ	
II	13	(30.2%)	30	(69.8%)	1.18 (0.40, 3.48)	
III	19	(28.4%)	48	(71.6%)	1.07 (0.39, 2.97)	
IV	10	(62.5%)	6	(37.5%)	4.52 (1.19, 17.15)*	
Current activity - Symptoms burden						
Good / Very good level	22	(21.4%)	81	(78.6%)	1ᵃ	1ᵃ
Moderate level	12	(42.9%)	16	(57.1%)	2.76 (1.14, 6.69)*	2.77 (1.07, 7.20)*
Bad / Very bad level	15	(71.4%)	6	(28.6%)	9.21 (3.20, 26.50)*	6.01 (1.84, 19.71)*

NB, ᵃIndicates reference category; *, $p<0.05$; **, $p<0.10$; COR, Crude Odds Ratio; AOR, Adjusted Odds Ratio; Hosmer-Lemeshow test, p, 0.580; Adjusted Nagelkerke R^2, 32.1%; Overall Predictive Ability; 79.6%

breast cancer. Regarding the current activity - burden of symptoms, most of patients had a normal activity without any symptoms ("very good level", 32.2%) or they had some symptoms but it did not require bed rest during the day ("good level", 35.5%). A high percentage of the study participants declared that they required bed rest less than 50% of the day ("moderate level", 18.4%). Also, 13.8% of patients stated that they required bed rest more than 50% of the day ("bad level") or they could not get out of bed ("very bad level"). Demographic, social, and clinical characteristics of the respondents are provided in Table 1.

Prevalence of Depression and Anxiety

The mean total score of PHQ-2 and GAD-2 questionnaire was 2.05 (SD=1.74) and 1.97 (SD=1.85), respectively. According to the cut off points of depression (PHQ-2 score ≥ 3) and anxiety (GAD-2 score ≥ 3), a high percentage of the breast cancer patients were at risk for psychiatric disorder. Specifically, the screening method showed prevalence 38.2% (58/152) for depression and 32.2% (49/152) for anxiety. Total scores of study scales are shown in Table 2.

Factors Associated with Depression

Eleven characteristics of breast cancer patients were analysed in logistic regression with depression as dependent variable to know their association. Results of univariate analyses showed that factors associated with the risk of depression at the 10% level were age, place of residence, marital status, educational level, religion, stage of cancer, and current activity - burden of symptoms. Those variables entered into stepwise logistic regression model (backward LR method). This multivariate analysis identified place of residence, religion, and current activity - burden of symptoms as significant predictors of depression risk. Specifically, those participants who were rural residents had 2.6 times (95% CI: 1.02, 6.40) more possibility to develop depression disorder than those who were urban residents. In addition, an interesting finding is that non-Orthodox Christians patients were 6.8 times (95% CI: 1.72, 26.90) more likely to have elevated depression symptoms compared with Orthodox Christians patients. As well, patients who had high level of symptoms burden were 3.8 times (95% CI: 1.20, 11.76) more likely to develop a risk for depression disorder than those who had normal activity without any symptoms or some symptoms but it did not require bed rest during the day. The final model seems to explain 22.6% in the variation of depression and it can properly classify 71.7% of breast cancer patients. Also, the fit of the multivariate model was perfectly (p=0.753). The results of univariate and multivariate analyses are presented in Table 3.

Factors Associated with Anxiety

Simple and multiple logistic regression analysis were performed to explore the association between anxiety and characteristics of breast cancer patients. Univariate analyses showed that age, place of residence, marital status, educational level, religion, stage of cancer, and current activity - burden of symptoms were correlated, at the

10% level of significance, with anxiety disorder. The crude odds ratios are shown in Table 4. In multivariate analysis (stepwise with backward LR method) place of residence, religion, and current activity - burden of symptoms were emerged as significant predictors of elevated anxiety symptoms. The adjusted odds ratios are shown in Table 4. Particularly, patients of rural areas were 3.8 times (95% CI: 1.41, 10.07) more likely than patients of urban areas to be at risk for anxiety disorder. Also, participants who were not Orthodox Christianity followers were 9.7 times (95% CI: 2.37, 39.69) at higher risk to develop elevated anxiety symptoms than those who were Orthodox Christians. In addition, patients who had high and moderate level of symptoms burden were 6.0 times (95% CI: 1.84, 19.71) and 2.8 times (95% CI: 1.07, 7.20), respectively, more likely to develop a risk for anxiety disorder than patients who had normal activity without any symptoms or some symptoms but it did not require bed rest during the day. This multivariable model explained 32.1% of the variance in anxiety risk and correctly classified 79.6% of patients. According to the Hosmer-Lemeshow test, the data fit the model perfectly (p=0.580).

Discussion

The purpose of this study was to assess the prevalence and associated factors of depression and anxiety in breast cancer patients, in order to identify independent predictors of mental health disorders risk. According to our results in the 38.2% of the patients depressive symptoms are present and the place of residence, religion, and current activity - burden of symptoms as significant predictors of depression risk. In addition 32.2% of them are experiencing anxiety symptoms and the place of residence, religion, and current activity - burden of symptoms were emerged as significant predictors of elevated anxiety symptoms.

Depression and anxiety are frequent diagnoses following the diagnosis of breast cancer and efficient ways of detecting those patients who are in risk for psychological distress is vital (Car et al., 2012; Moussas et al., 2012). In the already burdened mental state after the diagnosis of breast cancer, they add to the difficulties due to both therapeutic methods such as mastectomy and chemotherapy, and a series of social and family problems that escalate this condition (Dean, 1987). Moreover, psychological distress (symptoms of depression and anxiety) has been associated with poorer physical function (Faller et al., 2017) and high mortality risk (Batty et al., 2017; Hjerl et al., 2003).

Approximately 38% of the breast cancer patients in the study were diagnosed with depression and 32% of them with anxiety based on PHQ2 and GAD2 questionnaires. The prevalence of depression and anxiety in patients with breast cancer of our study were similar of those in previous studies (Srivastava et al., 2016; Hassan et al., 2015) on psychiatric morbidity among breast cancer patients, although most of them are reporting more elevated symptoms of anxiety than depression. One possible explanation on that is that there are many methodological differences in the studies. In addition worth's to be

mentioned that our subjects were more likely to experience anxiety and depression symptoms than other studies conducted in Greek cancer patients (Polikandrioti, 2008) and other countries as well (Lueboonthavatchai, 2007). Mostly due to the fact that in the emotional burdens of the disease itself adds up the existing financial situation in Greece (Lavdaniti et al. 2012). In a recent study contucted by Fradelos et al (2017) the prevalence of depression and anxiety in breast cancer patients were 54.5% and 46.8% respectively, similar finding were reported from other studies as well (Galloway et al., 2012).

As it was mentioned age, area of residence, marital status, education level, religious affiliation, stage of cancer and symptom burden found to be associated with presence of depression in our study but only place of residence, religion, and current activity - burden of symptoms identified as significant predictors of depression risk. While despite the fact that age, place of residence, marital status, educational level, religion, stage of cancer, and current activity - burden of symptoms were correlated, at 10% level of significance, with anxiety disorder similar only place of residence, religion, and current activity - burden of symptoms were emerged as significant predictors of elevated anxiety symptoms.

In a recent observational study in primary care settings in Germany it was found that older patients was 1.2 more likely to experience depressive and anxiety symptoms (p<0.001) than patients that were younger (Engelhard et al., 2015) those finding are reinforced by the findings of our study. In addition married patients of our study reported fewer symptoms of anxiety and depression. Married individuals perceive more social support through the extended family network that is present in Greek society. This finding is in agreement with a recent study in Western Cape, South Africa which concluded that patients (Kagee et al., 2017).

One more finding of our study was that less educated women dealing with breast cancer was more likely to experience depression and anxiety symptoms. Similar finding were reported by Osborne et al., (2003), in a study among 751 breast cancer patients found that women with little education (up to Year 8) were four times more likely to more anxious compared with those who had a higher education degree. Our finding reinforcing finding from the existing literature and supporting the assumption that education can be a protective factor in the occurrence of depression and anxiety among women dealing with breast cancer (Hopwood et al., 2010; Bener et al., 2017). This finding can be attribute to the fact that women with higher educational status can have better access to information regarding their health condition and be fully aware and understand the treatment plan and what is to be expected from it.

Regarding the influence of patients' religious affiliation we found that those who had other than Christian orthodox religious affiliation (including not religious persons) were more likely to be classified as depressed and anxious. Religiosity and spirituality have been recognized as a source of support that helps the individual to overcome life difficulties and stressful events such as a diagnosis of cancer.

Moreover area of residence found to be a significant predictor for depression and anxiety for breast cancer patients. The association of depression and anxiety and area of residence in breast cancer and in cancer patients in general is a conflicted finding in the existing literature as there are many studies supporting this relation and many studies which opposes it (Lavdaniti et al. 2012). According to our results patients who lived in rural areas where most likely to experience anxiety and depressive symptoms finding that confirmative to previous studies (Ell et al., 2005). This finding can be partially explained due to the poor accessibility to health care services that rural population faces (Arcury et al., 2005; Papaspyrou et al., 2015). This along with the uncertainty that cancer arise for the individual can elevate the depression and anxiety symptomatology among breast cancer patients.

Finally, according to our results patients who were diagnosed in stage IV of breast cancer were in a high risk for depression and anxiety compered to stage I patients. This finding is in accordance to a recent study among breast cancer in Greece (Fradelos et al., 2017) in which stage IV breast cancer patients were 1.9 (p=0.003) more likely to experience depressive symptoms. Moreover, symptom burden were found to be a significant predictor for depression and anxiety in our study. This finding is confirmative for previous studies concluding that depression and anxiety are associated with higher symptom burden and worse physical functioning (Inhestern et al., 2017; Fradelos et al., 2017; Mustian et al., 2012).

In conclusions, there is a high prevalence of anxiety and depression among breast cancer patients. Being rural resident, non-Orthodox Christian and experiencing extend symptom burden can be predicting factors associated with depression and anxiety in breast cancer patients. Early detection and proper referral can contribute in addressing those conditions and increase quality of life and survival in breast cancer patients.

References

Agorastos A, Demiralay C, Huber CG (2014). Influence of religious aspects and personal beliefs on psychological behavior: focus on anxiety disorders. *Psychol Res Behav Manag*, **7**, 93–101.

Arcury T, Preisser J, Gesler W, Powers J (2005). Access to Transportation and Health Care Utilization in a Rural Region. *J Rural Health*, **21**, 31-8.

Batty G, Russ T, Stamatakis E, Kivimäki M (2017). Psychological distress in relation to site specific cancer mortality: pooling of unpublished data from 16 prospective cohort studies.

BMJ, **356**, j108.

Beatty L, Kissane D (2017). Anxiety and depression in women with breast cancer. *Cancer Forum*, **41**, 55.

Bener A, Alsulaiman R, Doodson L, Agathangelou T (2017). Depression, hopelessness and social support among breast cancer patients: in highly endogamous population. *Asian Pac J Cancer Prev*, **18**, 1889–96.

Burgess C, Cornelius V, Love S, et al. (2005). Depression and anxiety in women with early breast cancer: five year observational cohort study. *BMJ*, **330**, 702.

Car J, Zycińska J, Lasota W (2012). Assessment of psychological distress and depression in cancer patients. *Przegl Epidemiol*, **66**, 689-95.

Christensen H, Marck D (2017). The efficacy of mindfulness based stress reduction (MBSR) for decreasing anxiety and depression among breast cancer survivors. *Sch Physician Assist Stud*, **16**, 613.

Ell K, Sanchez K, Vourlekis B, et al (2005). Depression, correlates of depression, and receipt of depression care among low-income women with breast or gynecologic cancer. *JCO*, **23**, 3052-60.

Engelhard J, Bleicher L, Kostev K (2015). Prevalence of depression and anxiety and their risk factors in women with breast cancer In German primary care. *Value Health*, **18**, A431.

Fafouti M, Paparrigopoulos T, Zervas Y, et al (2010). Depression, anxiety and general psychopathology in breast cancer patients: A cross-sectional control study. *In Vivo*, **24**, 803–10.

Faller H, Strahl A, Richard M, Niehues C, Meng K (2017). Symptoms of depression and anxiety as predictors of physical functioning in breast cancer patients. A prospective study using path analysis. *Acta Oncol*, **56**, 1677-81.

Fanakidou I, Zyga S, Alikari V, et a (2017). Mental health, loneliness, and illness perception outcomes in quality of life among young breast cancer patients after mastectomy: the role of breast reconstruction. *Qual Life Res*, **8**, 1-5.

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.

Fiorentino L, Rissling M, Liu L, Ancoli-Israel S (2011). The symptom cluster of sleep, fatigue and depressive symptoms in breast cancer patients: severity of the problem and treatment options. *Drug Discov Today Dis Models*, **8**, 167–73.

Hassan M, Shah S, Ghazi H, et al. (2015). Anxiety and depression among breast cancer patients in an urban setting in Malaysia. *Asian Pac J Cancer Prev*, **16**, 4031-5.

Hjerl K, Andersen E, Keiding N, et al (2003). Depression as a prognostic factor for breast cancer mortality. *Psychosomatics*, **44**, 24-30.

Hopwood P, Sumo G, Mills J, Haviland J, Bliss J (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 J*, **19**, 84-91.

Inhestern L, Beierlein V, Bultmann JC, et al (2017). Anxiety and depression in working-age cancer survivors: a register-based study. *BMC Cancer*, **17**, 347.

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.

Krebber AMH, Buffart LM, Kleijn G, et al (2014). Prevalence of depression in cancer patients: a meta-analysis of diagnostic interviews and self-report instruments. *Psychooncology*, **23**, 121–30.

Kroenke K, Spitzer RL, Williams JB, Löwe B (2010). The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. *Gen Hosp Psychiatry*, **32**, 345-59.

Kroenke K, Spitzer RL, Williams JB, Monahan PO, Löwe B (2007). Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med*, **146**, 317-25.

Kroenke K, Spitzer RL, Williams JB (2003). The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care*, **41**, 1284-92.

Lavdaniti M, Barbas G, Fratzana A, Zyga S. (2012). Evaluation of depression in colon cancer patients. HSJ, 6, 681-692

Linden W, Vodermaier A, MacKenzie R, Greig D (2012). Anxiety and depression after cancer diagnosis: Prevalence rates by cancer type, gender, and age. *J Affect Disord*, **141**, 343–51.

Löwe B, Wahl I, Rose M, et al (2010). A 4-item measure of depression and anxiety: validation and standardization of the patient health questionnaire-4 (PHQ-4) in the general population. *J Affect Disord*, **122**, 86-95.

Lueboonthavatchai P (2007) Prevalence and psychosocial factors of anxiety and depression in breast cancer patients. *J Med Assoc Thai*, **90**, 2164-74.

Maass SWMC, Roorda C, Berendsen AJ, Verhaak PFM, de Bock GH (2015). The prevalence of long-term symptoms of depression and anxiety after breast cancer treatment: A systematic review. *Maturitas*, **82**, 100–8.

Moussas GI, Papadopoulou AG, Christodoulaki AG, Karkanias AP (2012). Psychological and psychiatric problems in cancer patients: Relationship to the localization of the disease. *Psychiatriki*, **23**, 46-60

Mustian KM, Sprod LK, Janelsins M, Peppone LJ, Mohile S (2012). Exercise recommendations for cancer-related fatigue, cognitive impairment, sleep problems, depression, pain, anxiety, and physical dysfunction: A review. *Oncol Hematol Rev*, **8**, 81–8.

Ng CG, Mohamed S, Kaur K, et al (2017). Perceived distress and its association with depression and anxiety in breast cancer patients. *PLoS One*, **12**, e0172975.

Osborne R, Elsworth G, Hopper J (2003). 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,* **39**, 755-62.

Pinto AC, de Azambuja E (2011). Improving quality of life after breast cancer: Dealing with symptoms. *Maturitas*, **70**, 343–8.

Polikandrioti M, Evaggelou E, Zerva S, et al (2008). Evaluation of depression in patients undergoing chemotherapy. *HSJ*, **2**, 162-72

Reich M, Lesur A, Perdrizet-Chevallier C (2008). Depression, quality of life and breast cancer: a review of the literature. *Breast Cancer Res Treat*, **110**, 9–17.

Rogers LQ, Courneya KS, Anton PM, et al (2017). Effects of a multicomponent physical activity behavior change intervention on fatigue, anxiety, and depressive symptomatology in breast cancer survivors: randomized trial. *Psychooncology*, **26**, 1901–6.

Srivastava V, Ansari MA, Kumar A, et al (2015). Study of anxiety and depression among breast cancer patients from North India. *Clin Psychiatry*, **2**, 1-7

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.

Walker J, Hansen CH, Martin P, et al (2014). Prevalence, associations, and adequacy of treatment of major depression in patients with cancer: a cross-sectional analysis of routinely collected clinical data. *Lancet Psychiatry*, **1**, 343–50.

Würtzen H, Dalton SO, Elsass P, et al (2013). Mindfulness

significantly reduces self-reported levels of anxiety and depression: Results of a randomised controlled trial among 336 Danish women treated for stage I–III breast cancer. *Eur J Cancer*, **49**, 1365–73.