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Authors

Davis, Claudia M
Myers, Hector F
Nyamathi, Adeline M
[et al.](#)

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Claudia M. Davis PhD, Hector F. Myers PhD, Adeline M. Nyamathi ANP PhD FAAN, Mary Lynn Brecht PhD, Mary Ann Lewis FNP DrPH FAAN & Nalo Hamilton PhD MSN WHNP/ANP-BC

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Biopsychosocial Predictors of Psychological Functioning Among African American Breast Cancer Survivors

CLAUDIA M. DAVIS, PhD

*Center for Health Disparities Research and Training, California State University,
San Bernardino, CA, USA*

HECTOR F. MYERS, PhD

*Center for Medicine, Health & Society, Department of Psychology, Vanderbilt University,
Nashville, TN, USA*

ADELINE M. NYAMATHI, ANP, PhD, FAAN, MARY LYNN BRECHT,
PhD, MARY ANN LEWIS, FNP, DrPH, FAAN,
and NALO HAMILTON, PhD, MSN, WHNP/ANP-BC

School of Nursing, University of California Los Angeles, Los Angeles, CA, USA

This study examined the relationships of biological and psychosocial predictors as contributing factors to the psychological functioning among breast cancer survivors. A sample of (N = 155) African American breast cancer survivors were recruited from California. A general linear model was utilized to examine the relationships. Biological and psychosocial risk factors were significant predictors for anxiety and depression. These predictors can be viewed as contributing factors to the psychological well-being of this cohort. Anxiety and depression are often under-recognized and subsequently undertreated in survivors. Understanding the predictors of depression and anxiety is necessary for incorporating a multidisciplinary approach to address this problem.

KEYWORDS *breast cancer disparities, African American women, predictors, psychological functioning, anxiety, depression*

Address correspondence to Claudia M. Davis, PhD, Center for Promotion of Health Disparities Research & Training, Department of Nursing, Health & Physical Education Complex, 226, California State University–San Bernardino, 5500 University Parkway, San Bernardino, CA 92407. E-mail: cmdavis@csusb.edu

INTRODUCTION

Nationwide, more than 232,340 women are diagnosed with breast cancer each year (American Cancer Society [ACS], 2013), yet the disease trajectory is quite different among women of various racial groups. There is compelling evidence that race is a significant independent risk factor for breast cancer mortality (Newman et al., 2006). Although African American women have a lower incidence of breast cancer, they have an overall higher mortality rate compared with women of other racial groups (ACS, 2013). Furthermore, African American women are more likely to be diagnosed with breast cancer at an advanced stage when compared to other women (Crowe et al., 2005; Shavers, Harlan, & Stevens, 2003). They are also more likely to have biomarkers that are estrogen and progesterone receptor negative (Dignam, 2000; Joslyn, 2002) and have a greater propensity to be diagnosed with tumors that are known as triple negative breast cancer (TNBC) compared with other women (Bauer, Brown, Cress, Parise, & Caggiano, 2007; Lund et al., 2009).

In addition, the quality of cancer care may be quite different for racial and ethnic groups along the breast cancer trajectory. In fact, Elmore et al. (2005) reported that African American women often experience differences that were attributed to race at every step of the illness trajectory, including timeliness and identification of their first symptoms, the timing of diagnosis, and the initiation of breast cancer treatment. In the following seminal studies, African American women were less likely to get the recommended treatment for their breast cancer (Bickell et al., 2006; Bradley, Given, & Roberts, 2002; Mandelblatt et al., 2002). Unequal treatment in the provision of care can also be attributed to breast cancer disparities. Li, Malone, and Daling (2003) reported that 21% of African American patients failed to receive the minimum standard of care as recommended compared to 15% of White patients. With breast conserving surgery (BCS), radiation is the cornerstone for treatment as it decreases the likelihood of recurrence and thus increases survival (Clarke et al., 2005). Yet African Americans women are less likely to receive radiation when compared to other groups (Haggstrom, Quale, & Smith-Bindman, 2005), which may contribute to more unfavorable disease outcomes and subsequent worry.

Coupled with the differential effects that socioeconomic status (SES) and stress may have on different ethnic groups (Geronimus, Hicken, Keene, & Bound, 2006; Myers, 2009), it is likely that chronic burden and episodic stress burden (Schulz, Parker, Israel, & Fisher, 2001) may have a profound effect on the health of many African Americans (Geronimus, Hiken, Keen, & Bound, 2006). Interestingly, documentation that chronic stress induces a sustained "allostatic load" in a variety of biological processes, including the immune system, is well cited in the literature (McEwen, 1998; McEwen & Seeman, 1999) and among African American breast cancer survivors

(Pierce et al., 2009). Given the empirical evidence on biological and psychosocial risk factors, and in particular, the burden of chronic stress exposure, one of the inherent overarching questions is how do these particular experiences affect the psychological functioning of African American breast cancer survivors?

Although there is cursory evidence regarding the biological, psychosocial, and behavioral factors that African American women experience, to date, there has been a paucity of empirical evidence that explored how all of these factors affect the psychological functioning among these women. To that end, the specific aim of this study was to examine the role of biological predictors, specifically estrogen receptors (ER), progesterone receptors (PR), triple negative breast cancer (TNBC), BRCA1/2 gene (BRCA1/2), Tumor Protein 53 gene (TP53/p53), age <45, Basal Metabolic Index (BMI), age of first pregnancy, psychosocial risk factors (socioeconomic position [SEP]), and chronic stress as contributing factors to the psychological functioning (anxiety, depression) of African American breast cancer survivors.

LITERATURE REVIEW

Biological Risk Factors

Biological risk factors are physical characteristics such as age and gender, which may increase the chances of incurring a specific type of cancer (National Cancer Institute, 2009). Based on the literature, seven biological risk factors are more likely to occur in all women, but in a higher percentage in women of African ancestry. These include the prevalence of ER, PR negative status (Dignam, 2000; Joslyn, 2002), TNBC (Bauer et al., 2007; Lund et al., 2009), and the p53 gene (Dookeran et al., 2010). In addition, being of a young age at diagnosis (Palmer, Wise, & Horton, 2003; Shavers et al., 2003), having an increased BMI (Lu et al., 2011; Sarkissyan, Wu, & Vadgama, 2011), and increased risk of greater parity (Palmer et al., 2011; Palmer et al., 2003) are all contributing factors. Collectively these risk factors may increase the burden of chronic stress.

Chronic Stress

Many ethnic groups, and in particular, African Americans, are likely to carry a heavier burden of chronic stress compared to Whites, primarily due to socioeconomic disadvantage (Myers, Lewis, & Parker-Dominguez, 2003) and exposure to unfair treatment (Smedley, Stith, & Nelson, 2003). Some African American and Hispanic women are more likely to experience food insecurities than other women (Kaiser, Baumrind, & Dumbald, 2007) that may add another burden of stress for low-income women. Neighborhoods and surrounding communities play a significant role in the predictors of

health outcomes given the chronic stress experienced by members of racial and ethnic groups (Diez Roux, 2001). In fact, for some African American women who reside in urban communities, life stressors such as finances, work, and safety are associated with a significant burden of disease (Schulz et al., 2001). These stressors may add another layer of burden for women along the breast cancer trajectory.

Another area that is of great concern for all cancer survivors, but in particular for African American breast cancer survivors whose breast cancers are generally at an advanced stage of disease (Crowe et al., 2005; Ries et al., 2005) and more aggressive (Furberg, Millikan, Dressler, Newman, & Geradts, 2001; Lund et al., 2009), is the constant threat of fear of recurrence may create an additional source of stress. A recent study by Taylor et al. (2012) explored the fear of recurrence among 51 African American breast cancer survivors; findings revealed that fear about recurrence and death was rated low to moderate ($M = 2.65$, $SD = 1.44$) among these women.

Socioeconomic Position

There is strong and compelling evidence that there is a differential cancer burden in certain populations, especially the socioeconomically disadvantaged, racial/ethnic groups, the medically underserved, and older adults (McCord & Freeman, 1990; Smedley, Stith, & Nelson, 2003). *Socioeconomic position* (SEP) is defined as socially derived economic factors that are important to consider when determining the positions that individuals and/or groups hold within a stratified society (Krieger, Williams, & Moss, 1997). An area of great concern for all women, regardless of race, but particularly for poor women and for women of color, is the economic burden of breast cancer. Sociodemographic characteristics may have a significant impact on whether African American women would be more likely to utilize adjuvant chemotherapy as compared to other racial groups (Schleinitz, DePalo, Blume, & Stein, 2006). Breast cancer patients with limited financial resources are likely to face this additional economic burden (Arozullah et al., 2004).

African American women with breast cancer were more likely to experience inequities in the comprehensiveness of treatment (Breen, Wesley, Merrill, & Johnson, 1999; Elmore et al., 2005; Gwyn et al., 2004). More recently, using Surveillance, Epidemiology and End Result (SEER)/Medicare data, Silber et al. (2013) conducted a longitudinal study of 7,375 African American women with breast cancer and their matched controls (based on age, year of diagnosis and specific SEER data site). Silber et al. determined that the overall 5-year survival was not due to a difference in treatment but rather due to the initial presentation of breast cancer among older African American women and their controls. Although this longitudinal study validates the need to explore the aggressive nature of breast cancer and disease

trajectory that may affect the psychological and physiological facets of the individuals' life; it is interesting to note that the authors did not account for completion of the treatment regimen that can account for increased breast cancer survival rates (National Cancer Institute, 2013) and for women with TNBC, which has been shown to occur disproportionately in women of African descent (Lund et al., 2009; Stark et al., 2010).

Psychological Functioning

The diagnosis and treatment of breast cancer are stressful events that have a significant impact on short- and long-term psychological functioning. In this study, psychological functioning is characterized as depression and anxiety. Depression and anxiety are psychological reactions that are frequently experienced in breast cancer patients (Ell et al., 2005; Sollner, Maislinger, Konig, Devries, & Lukas, 2004), and some studies suggest that African American women are especially likely to report high levels of cancer-specific distress (Hughes, Lerman, & Lustbader, 1996; McBride, Clipp, Peterson, Lipkus, & Demark-Wahnerfried, 2000).

Anxiety

In a meta-analysis, Mitchell et al. (2011) reported that the prevalence of anxiety was 16% and depression was 10% among cancer patients in general. Predictors of anxiety on cancer patients were severe pain (Galloway et al., 2012), functional limitations (Khan, Amatya, Pallant, & Rajapaska, 2012), and history of traumatic experiences (Green et al., 2000). Recently, Ploos van Amstel et al. (2013) determined that more than one third of breast cancer survivors experienced emotional distress (anxiety, depression, etc.), and survivors may need to be screened for any signs and/or symptoms of distress. Ferrante, Chen, and Kim (2008) determined that anxiety levels were significantly higher in a control group versus the treatment group. Although there has been significant research conducted on anxiety and breast cancer screening in African American women (Ferrante et al., 2008; Padgett, Yedidia, Kerner, & Mandelblatt, 2001), there was a dearth of quantitative research on anxiety and African American breast cancer survivors.

Depression

Several studies have reported that African American women, especially those from lower SES, are more likely to exhibit symptoms of distress than other women (Myers et al., 2002). In fact, researchers have found that 57% of women with breast cancer report "significant" depression that merit treatment

(Badger, Braden, & Mishel, 2001; Morrasso et al., 2001). In a ground-breaking study using structural equation modeling (SEM), L. S. Porter et al. (2006) examined predictors of negative mood and personal growth in a sample of White ($n = 369$) and African American ($n = 155$) breast cancer survivors. These authors determined that for both groups, more symptoms ($B = .023$, $t = 2.981$), increased religious participation ($B = .184$, $t = 5.761$), higher education ($B = .032$, $t = 3.514$) and younger age ($B = -.013$, $t = -4.329$) were directly associated with increased levels of personal growth.

In terms of a conceptual framework, the biopsychosocial model of breast cancer survivorship for African American Women (BBCS) (Davis & Myers, 2008) serves as the guiding framework for this study. The BBCS model delineates relationships of biological and psychosocial risk factors and psychological functioning among African American women breast cancer survivors. The authors hypothesized that biological risk factors (ER, PR, BRCA, TNBC, p53, age of diagnosis < 45 , age of first pregnancy < 30) and psychological risk factors (SEP, chronic stress) predict psychological functioning (depression, anxiety) among African American women breast cancer survivors (see Figure 1).

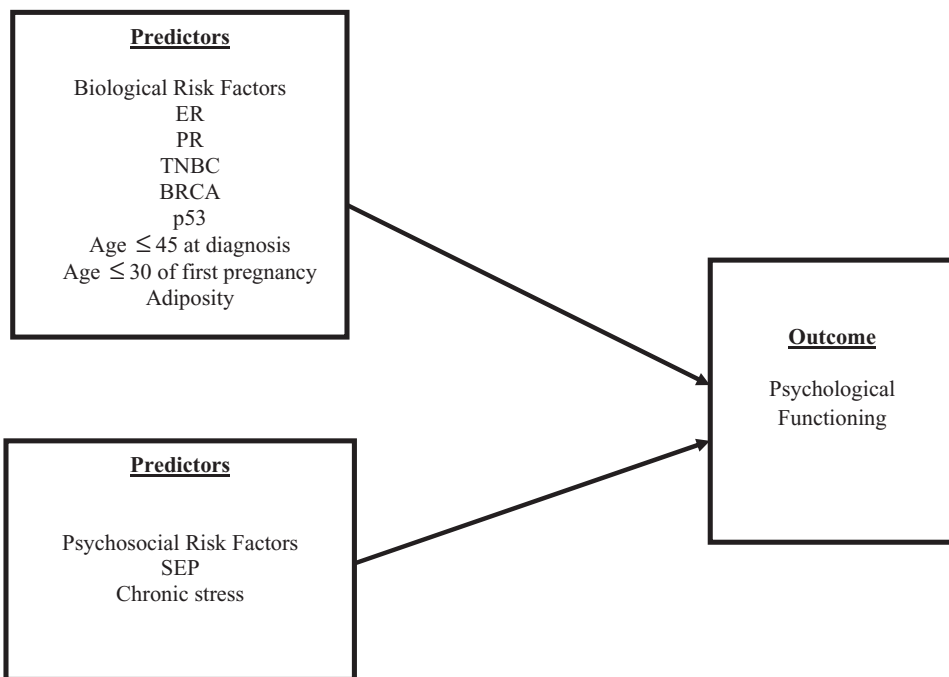


FIGURE 1 Biopsychosocial model of breast cancer survivorship for African American women.

METHOD

Study Design and Sample

One hundred and sixty-nine women were screened, 160 were deemed eligible and scheduled to be interviewed, and of those, two women chose not to participate and three women did not show up for their interview. This resulted in the final sample of 155 who met the eligibility requirements.

Inclusion/Exclusion Criteria

Eligible participants were women who self-identified as African, African American, Black, or Black American, age 25 years or older, diagnosed with breast cancer, at least one year postactive cancer treatment, and capable of providing informed consent. Participants were excluded if they self-identified as being from any other race/ethnicity, if they were currently undergoing breast cancer treatment and incapable or unwilling to provide informed consent or were diagnosed with a different primary (cancer). The study was approved by the Institutional Review Board (IRB), and written informed consent was obtained from each participant.

Recruitment

All participants were residents of California and recruited using three methods: (1) 12 African American breast cancer survivor groups, (2) word of mouth, and (3) through flyers in key community locations, for example, civic groups, nonprofit organizations, local churches, hair salons, and unisex barber shops. Interested individuals who were identified by these methods were instructed by the flyer to contact the study principal investigator (PI) by calling a designated research telephone number. Upon calling the research telephone number, a telephone script (approved by IRB) was initiated. All potential participants were screened to determine if they met the eligibility criteria. Once eligibility was determined, the potential participants were informed that they were eligible to participate in the study. They were then asked how they heard about the study, if they belonged to a support group, and, if applicable, the name of their breast cancer support group. Women who were members of a support group met the PI in a designated area provided at their monthly support group meeting. Women who were not members of a support group, and were recruited by word of mouth or via recruitment flyers, were assessed for eligibility by phone. Once determined to be eligible, arrangements were made between the PI and the potential participants to meet at an agreed-upon location within their community.

Procedures

Upon meeting with the PI, participants were informed about the purpose of the study, and all questions were addressed. All were informed that it would take approximately one hour to complete the surveys. All data were collected through either a face-to-face interview or a self-administered battery of questionnaires. Assistance was provided to participants who preferred to have their surveys read to them; responses were hand-written, verbatim. For participants who were not members of a support group, the surveys were self-administered in a public or a private location, such as in public rooms in libraries, coffee houses, and so on. Upon completion, all participants received a \$10 Target gift card for expenses associated with gas and local travel.

Instruments

A Demographic Data Questionnaire (DDQ) was used to obtain general demographic information, such as age, ethnicity, marital status, education, family income, and household information. SEP was measured by education and income. Education was assessed as one of nine categories, 1 = less than high school diploma to 9 = professional degree. For purposes of the analyses, the categories were collapsed to 4: 1 = high school or below, 2 = some college, vocational certificate/associate degree, 3 = Bachelor's degree, and 4 = advanced degrees. Household income was assessed as one of 13 categories from 1 = less than \$5000 to 13 = greater than \$150,000. For purposes of the analysis, income categories were collapsed to 1 = < \$40,000, 2 = \$40,000 to \$79,000 and 3 = \$80,000 and beyond. Height and weight, comorbidities, religious affiliation, stage of breast cancer, and type of treatment was assessed.

Risk Factors

Information on biological risk factors was obtained with a series of questions on the DDQ that asked participants whether they knew or were informed that they had any of the following biological risks for breast cancer: ER, PR status, TNBC, BRCA1/2 gene, p53 gene, specific questions regarding age at diagnosis—younger than age 45, age of when they were first pregnant—specifically before age 30, and BMI were requested. Data on psychosocial risk factor (SEP-characterized as education and income) was obtained from the DDQ.

Chronic Stress

The burden of chronic stress was assessed with the 21-item Chronic Burden Scale (CBS) (Gurung, Taylor, Kemeny, & Myers, 2004), as the accumulated

burden of ongoing life stresses, including but not limited to stresses from finance, housing, employment, medical problems, child care, and so on. The CBS measures the individual's experience of common stressors in the past 6 months, with a higher score indicating a greater chronic stress burden. This tool was used to measure the chronic burden that many women experience, particularly in the context of breast cancer and other diseases (Sasser et al., 2005).

The measure asked respondents to rate their responses on a 4-point Likert-type scale ranging from 0 (*not a problem for me in the past 6 months*) to 4 (*this is a major problem for me in the past 6 months*). A life stress score was calculated as the sum across the 21 items. The CBS was assessed on a cohort of 350 women who were sero-positive for human immunodeficiency virus (HIV). Cronbach's alpha for this study was 0.75 (Gurung et al., 2004). Alpha coefficient for the CBS in our sample was .76.

OUTCOMES

Psychological Functioning

DEPRESSION

Psychological functioning, characterized as depression, an outcome of this study, was defined as an alteration in one's mood, characterized by sadness, a feeling of hopelessness, and loneliness. Severity of depression symptoms was measured using the Beck Depression Inventory–II (BDI-II) (Beck, Steer, & Brown, 1996). The BDI-II is a widely used measure of depression in adults. A 21-item, self-report, measure of depression, each item is rated on a 4-point Likert-type scale ranging from 0 to 3, with higher scores indicating higher levels of depression. Respondents were asked to endorse statements characterizing how they have been feeling during the past 2 weeks. The measurement assessed feelings such as sadness, hopelessness, pessimism, sense of failure, dissatisfaction, guilt, social withdrawal, and other symptoms of depression. The measure yields a maximum score of 63, with scores of 0 to 13 denoting minimal depression, scores of 14 to 19 denoting mild depression, scores of 20 to 28 denoting moderate depression, and scores of 29 to 63 denoting severe depression. Alpha coefficient for the BDI-II in our sample was .90.

ANXIETY

Anxiety was defined as a feeling of uneasiness, characterized by tachycardia, tachypnea, and sweating. Characteristics of anxiety are self-reported symptoms, such as numbness or tingling, feeling hot, wobbliness in legs, inability to relax, dizziness or lightheadedness, heart pounding, nervousness, fear of dying, choking, scared, and terrified (Beck, Epstein, Brown, & Steer, 1988). Anxiety was assessed using the Beck Anxiety Index (BAI) (Beck et al., 1988).

The BAI is a 21-item scale that measures the severity of self-reported anxiety symptoms in adults. It consists of descriptive statements of anxiety symptoms that are rated on a 4-point scale from *not at all* (0); *mildly; it did not bother me much* (1); *moderately; it was very unpleasant, but I could stand it* (2); and *severely; I could barely stand it* (3). The measure yields a maximum score of 63, 0 to 7 reflecting “minimal level of anxiety,” scores of 8 to 15 indicating “mild anxiety,” scores of 16 to 25 reflecting “moderate anxiety,” and scores of 26 to 63 indicating “severe anxiety.” The BAI has demonstrated high reliability $\alpha = .92$ (Beck, et al., 1988), in a final sample ($N = 160$) of male outpatient psychiatric patients. The racial/ethnic composition was not reported. Alpha coefficient for the BAI in our sample was .87.

Data Analysis

Data were screened prior to conducting statistical analysis for accuracy, outliers, and missing data. Using SPSS 18, descriptive statistics including frequencies, percentages, means, standard deviations, and ranges were used to describe the sample. Reliabilities were also determined for all instruments, and significance was established at the .05 level for inferential analyses. Pearson correlations were utilized to examine relationships among all variables. A general linear model (GLM) approach was used to estimate and examine the regression parameters of the independent variables, specifically biological risk factors (ER, PR, TNBC, BRCA, p53, age < 45, age of first pregnancy < 30, and BMI), psychosocial risk factors (SEP, chronic stress) as predictors of psychological functioning as characterized by anxiety and depression (outcomes) as depicted in the BBCS for African American breast cancer survivors (see Figure 1). Separate models were estimated for the two sets of predictors (biological and psychosocial). Main assumptions were also examined, including linearity, independence of errors, homoscedasticity, and normality of error distribution. Results indicated that assumptions were not violated. For purposes of the analysis, sum scores were used for levels of anxiety and depression. Education level was collapsed and categorized into 2 categories, 1 = less than college, 2 = Bachelor's degree. Income was collapsed to two categories, 1 = less than \$50,000 and 2 = greater than or equal to \$50,000. Age of first pregnancy was ≤ 30 , and age of breast cancer diagnosis ≤ 45 .

RESULTS

Demographics

Sample characteristics are shown in Table 1. The sample of 155 participants was relatively young when diagnosed. The mean age at diagnosis was 51.67 ($SD = 10.03$). Mean survivorship years was 9.7 with a range from 1 to 27 years. Most were married (38.0%) or divorced (28.4%). Close to one half identified as Christian (43.9%) and a few (5.8%) had no religious affiliation. The sample was generally well educated with almost one half (48.4%)

TABLE 1 Demographic Characteristics of Participants ($N = 155$)

Characteristic	\bar{x}	SD	Range	n	%
Age (age of diagnosis)	51.7	10.03	31–77		
Years of survivorship	9.17	6.80	1–27		
Characteristic					
Marital Status					
Single				23	14.8
Married				67	43.2
Separated				13	8.4
Divorced				34	21.9
Living together				8	5.2
Widowed				10	6.5
Religion					
Christian				128	82.7
Muslim				14	9.0
Buddhist				3	1.9
No Religion				9	5.8
Missing				1	0.6
Yearly income (\$)					
≤ 39K				59	38.0
40–79K				66	42.6
≥ 80K				20	12.9
Did not respond				10	6.5
Work Status					
Working full-time				50	32.3
Part time				17	11
Unemployed laid off				2	1.3
Looking for work				1	0.6
Keeping house/raising children				10	6.5
Retired				52	33.5
Disabled				23	14.8
Education					
High school (HS) diploma, Equivalency Diploma, or less than HS				17	11.0
Some college, vocational or Associate degree				63	40.6
Bachelor degree				41	26.5
Graduate degree and professional degree				34	21.9
Home type					
Own				103	66.5
Rent				39	25.2
Other				13	8.3
Age at first pregnancy					
No kids				28	18.1
Younger than age 19				40	25.8
Ages 20–30				76	49.0
Ages 31–40				10	6.5
Missing				1	0.6

TABLE 2 Biological Characteristic of Breast Cancer ($N = 155$)

	Frequency	%
Estrogen status (ER)		
Negative	37	23.9
Positive	55	35.5
Unknown	60	38.7
Missing	3	1.9
Total	155	100
Progesterone status (PR)		
Negative	28	18.1
Positive	32	20.6
Unknown	94	60.6
Missing	1	0.6
Total	155	100.0
BRCA (BReastCAncer)		
Yes	11	7.1
No	131	84.5
Don't know	8	5.2
Missing	5	3.2
Total	155	100.0
p53 Gene (Protein 53 Gene)		
Yes	3	1.9
No	112	72.3
Unknown	39	25.2
Missing	1	0.6
Total	155	100.0
Triple negative breast cancer (TNBC)		
Yes	18	11.6
No	104	67.1
Don't Know	32	20.0
Missing	1	0.6
Total	155	100.0
Breast cancer stage		
Stage 0	5	3.2
Stage 1	29	18.7
Stage 2	59	38.1
Stage 3	36	23.2
Stage 4	17	11
Don't know	6	3.9

reported having a college degree or higher. More than 42.6% of the survivors had an annual income ranging from \$40,000 to \$79,000 annually. Home ownership was quite prevalent as 66% were homeowners and just above 25.8% were renters. More than 33% were working full-time, more than 34% were retired, and close to 15% identified themselves as disabled.

Biological Characteristics of Breast Cancer

Table 2 represents the biological characteristic of breast cancer among the survivors. Although close to 36% were ER+, 24% were ER-, and more than

38% did not know their ER status. In terms of PR status, more than 18% were PR⁻, whereas close to 21% were PR⁺, more than 60% did not know their PR status. Above 7% had the BRCA gene, and close to 2% of the women were aware that they had a p53 gene mutation.

In terms of TNBC, more than 11.6% of the sample indicated that they were told that they had TNBC; more than two-thirds (67.1%) reported that they had not been told if they had TNBC and 20.0% did not know if they had TNBC. Fewer than one in five (18.7%) had Stage 1 breast cancer, whereas more than one third (38.1%) had Stage 2 breast cancer and 23.2% had Stage 3 breast cancer. Stage 4 was reported in 11.0% of the sample. Average BMI for this sample was 30.06. Thirty percent of the participants were diagnosed with breast cancer at age 45 or younger. More than two thirds (72.2%) of the survivors had children at or prior to age 30.

Predictors of Anxiety

BIOLOGICAL

Table 3 represents the parameter estimates for the biological predictors, specifically ER status, PR status, BRCA, p53 gene, TNBC, age \leq 45 at diagnosis, age of first pregnancy younger than or at age 30, and BMI on reported anxiety symptoms (outcome). The biological predictor TNBC was significant for anxiety ($p < .001$). Specifically, those survivors who responded “no they had not been told that they had TNBC” had higher levels of anxiety symptoms than those who responded “don’t know.” Also, the survivors who knew that they had TNBC were also more likely to report symptoms of anxiety (than were those who responded “don’t know”), though this was not found to be statistically significant. In addition, BMI was found to be a significant biological predictor for anxiety ($p < .001$), with higher BMI associated with greater levels of anxiety symptoms. The model summary yielded a value of $F(8, 140) = 3.984$ $p < .001$ an $R^2 = .185$, adjusted $R^2 = .139$ accounting for a moderate proportion of variance on the dependent variable (anxiety).

Psychosocial

In Table 3, chronic stress was a significant predictor for anxiety ($p < .001$). Breast cancer survivors who reported higher levels of chronic stress were more likely to report increased symptoms of anxiety. Specifically, a one-unit increase in chronic stress is associated with a .52 unit increase in anxiety. Interestingly, SEP (inclusive of education and income) was not significant. The model summary yielded a value of $F(3, 141) = 14.739$, $p < .001$ with $R^2 = .239$ and an adjusted $R^2 = .223$, thus accounting for a moderate proportion of the variance on the dependent variable (anxiety).

TABLE 3 Summary of Linear Regression Analysis for Biological & Psychosocial Predictors (*N* = 155)

Variables	Model 1 Anxiety			Model 2 Depression		
	B	SE	<i>p</i>	B	SE	<i>p</i>
ER (Estrogen Receptor)						
Negative 1	-1.547	1.546	.319	-1.374	1.380	.321
Positive 2	-1.447	1.337	.281	-.472	1.194	.693
Reference category ^a = Unknown						
PR (Progesterone Receptor)						
Negative 1	1.056	1.704	.536	-1.365	1.522	.371
Positive 2	-1.242	1.345	.358	-1.415	1.201	.241
Reference category ^a = Unknown						
BRCA (BRestCancer gene)						
Yes 1	3.650	2.998	.226	.649	2.677	.809
No 2	.491	2.284	.830	.457	2.040	.823
Reference category ^a = Do not know						
p53 (Tumor Protein 53 gene)						
Yes 1	-2.969	3.905	.448	-1.633	3.487	.640
No 2	-2.581	1.518	.091	-2.425	1.355	.076
Reference category ^a = Do not know						
TNBC (Triple negative breast cancer)						
Yes 1	4.549	2.505	.072	4.445	2.237	.049
No 2	7.465	1.649	.000*	-1.044	1.480	.440
Reference category ^a = Do not know						
Age ≤ 45 at diagnosis	.611	1.217	.616	.596	1.087	.584
Reference category = > Age 45						
Age ≤ 30 first pregnancy	-.555	2.251	.806	-1.383	2.010	.493
Reference category = > Age 30						
BMI [Basal Metabolic Index (Kg/M ²)]	.379	.106	.001*	.151	.095	.114
Chronic burden	.519	.081	.001*	.341	.070	.001*
1 = Collapsed income < 50K	-.352	1.108	.751	.535	.958	.578
Reference category = > 50K						
1 = Collapsed education: associates, some college, & below	1.523	1.080	.161	1.026	.934	.273
Reference category = Bachelor's degree or above						
	Biological Predictors: Model 1 (Anxiety) <i>R</i> ² = .185 Adjusted <i>R</i> ² = .139			Biological Predictors: Model 2 (Depression) <i>R</i> ² = .150 Adjusted <i>R</i> ² = .061		
	Psychosocial Predictors: Model 1 (Anxiety) <i>R</i> ² = .239 Adjusted <i>R</i> ² = .223			Psychosocial Predictors: Model 2 (Depression) <i>R</i> ² = .171 Adjusted <i>R</i> ² = .153		

a = set at zero.

**p* < .05.

Predictors of Depression

BIOLOGICAL

In Table 3, our findings indicate that being diagnosed with TNBC was a significant predictor for depression. African American women breast cancer survivors who were aware that they had TNBC were more likely to report symptoms of depression ($p < .049$) than women who were not aware that they had TNBC. ER, PR, BRCA, p53, age of diagnosis, age of first pregnancy, and BMI were not statistically significant predictors of depression in this model. The model summary yielded a value of an $R^2 = .150$ and an adjusted $R^2 = .061$, thus accounting for a small proportion of the variance of the dependent variable (depression).

Psychosocial Predictors

Table 3 depicts that chronic stress was a significant predictor for depression ($p < .001$) among African American women breast cancer survivors. Specifically, as the survivors experienced chronic stress, they were more likely to report greater levels of chronic stress that were associated with higher levels of depression symptoms. SEP (inclusive of education and income) was not significant. The model summary yielded a value $F(3, 141) = 9.702$, $p < .001$ with an $R^2 = .171$ and an adjusted $R^2 = .153$ thus accounting for a small proportion of the variance on the dependent variable (depression).

DISCUSSION

Clinical Implications of the Study

Guided by the biopsychosocial model of breast cancer survivorship for African American women (Davis & Myers, 2008), the purpose of this study was to test a conceptual model and examine the relationships of biological and psychosocial risk factors on the psychological functioning (anxiety, depression) and quality of life among African American women breast cancer survivors. The results of this study revealed that the biological predictors of ER, PR, p53, the woman's age of first pregnancy ≤ 30 and ≤ 45 at diagnosis were not significant predictors of psychological functioning (anxiety and depression). Two biological predictors that were significant for anxiety were TNBC and BMI. Additionally, our results revealed that chronic stress (psychosocial) was a significant predictor for anxiety and depression.

TNBC is a complex disease that lacks HER2/Neu expression and has negative ER, PR receptors that are often difficult to treat (Dent et al., 2007). TNBC affects many women of various ethnic and racial backgrounds but appears to be more aggressive in women of African descent (Lund et al., 2009).

The diagnosis of TNBC appeared to spark fear in this cohort of women, who were primarily members of a support group. Although this study asked women if they were ever told that they had TNBC, our results did not reveal a significant difference in women who had been told of their TNBC status and those who had not been told of their TNBC status. To date, this is the first study to examine the relationship of biological predictors with anxiety. Furthermore, though a small percentage of women (11.6%) indicated that they were informed of their TNBC status, more than two thirds indicated that they were not aware. However, this does not indicate that they may not have had TNBC.

Our sample also had a high education level, was primarily part of support groups, and may have readily exchangeable information available about the complex nature and treatment outcomes that may have attributed to an underlying experience of anxiety. In addition, media releases and discussion by African American celebrities (Oprah Winfrey) may have increased the awareness of TNBC (Fisher, 2007). Our findings provide foundational information about the relationships among biological, psychosocial predictors and its effect on the psychological functioning of African American women breast cancer survivors.

Our findings also revealed that BMI was a predictor for anxiety among the survivors. To our knowledge, this is the first quantitative study that investigated the outcome of anxiety in an entire sample of African American women breast cancer survivors. Our findings were similar to Berger, Hertzog, Geary, Fischer, and Farr (2012), who reported that BMI was predictive of psychological functioning among breast cancer survivors. A study by Kwan et al. (2011) reported that for breast cancer survivors, the degree of obesity confers a greater risk for survival. In our sample, though the overall sample BMI was 30.06, caution should be taken with the measurement of BMI in some individuals of African ancestry. Aloia et al. (Aloia, Vaswani, Ma, & Flaster, 1997; Aloia, Vaswani, Mikhail, & Flaster, 1999) suggested that there may be confounding factors such as high bone density and skeletal muscle among African Americans women when compared to White women. However, we recognize that the literature does not appear to have a definitive answer on whether obesity confers breast cancer risk (Lu et al., 2011; Sarkissyan et al., 2011) and thus warrants further scrutiny.

This study revealed that chronic stress was a significant predictor of anxiety among African American women breast cancer survivors. This is an interesting observation, given that most of our sample were educated, middle class, and had a high SEP. Yet they still experienced a moderate level of chronic burden and stress, which gives credence to the findings of cumulative stressors (Geronimus, Hicken, Keene, & Bound, 2006; McEwen, 1998; Myers, 2009), that many African Americans experience. Chronic stress is a concern. Physiologically, African Americans who experienced chronic stress have a higher carotid vessel wall thickness, a precursor for carotid

artery disease, and for those who experienced discrimination, had more plaque buildup when compared to other racial/ethnic groups (Troxel, Matthew, Bromberger, & Sutton-Tyrell, 2003). In fact, analysis of data from the National Health and Nutrition Examination Survey ($N = 4,515$) determined that a higher allostatic load in individuals of African descent was also attributed to a higher mortality rate than individuals with cardiovascular and other medical conditions, while controlling for SES and behavioral factors (Duru, Harawa, Kermah, & Norris, 2012).

Our regression analysis revealed that TNBC was a significant biological predictor for depression. Specifically, African American women breast cancer survivors who knew that they had TNBC reported higher symptoms of depression than African American women breast cancer survivors who had not been told of their TNBC. The results of this study were similar to the findings of Cukier et al. (2013) of 148 African American women who were at risk for BRCA mutation. The authors reported that almost one half of the participants experienced psychological distress, specifically depression. Although this is the first study to explore biological predictors and its relationship to depression in African American women breast cancer survivors, our results revealed that depression was evident in our sample and was consistent with a study by Williams, Gonzales, and Neighbors (2007). In that study, Williams et al. reported that when African American women were diagnosed with depression, it was much more severe than their counterparts who are also studied. Our findings were also consistent with a recent study by Sheppard, Lanos, Hurtado-de-Mendoza, Taylor, and Adams-Campbell (2013), who reported that African American women experienced greater depressive symptomology when compared to other women.

The findings from this study revealed that chronic burden was a significant predictor for depression. Researchers have reported that the cumulative lifetime stress may affect the health of many African Americans (Geronimus et al., 2006; Myers, 2009). This is the first study to report that chronic burden was a significant predictor for depression among African American women breast cancer survivors.

Demographically, 72.8% our sample had children at or younger than age 30, which generally decreases the risk for breast cancer. In our sample, 30.3% were diagnosed with breast cancer at or before age 45. Although having children before age 30 generally lowers the risk of breast cancer, it appears that for some African American women breast cancer survivors there may be some other factors that need further exploration.

Implications for Research and Practice

A deeper understanding of the relationship between TNBC and psychological functioning is warranted for the following reason. First, most studies that

investigated anxiety in breast cancer survivors imparted knowledge/findings that can be generalized to several specific racial/ethnic groups (Aerts, De Vries, Van der Steeg, & Roukema, 2011; Cheung, Lee, & Chan, 2013), but not to African American women breast cancer survivors, indicating the paucity of research on this particular area. Additionally, there was a substantial literature on the many facets of TNBC among African women, which is well needed; however, there is a strong need to expand and build on the biobehavioral factors (for TNBC) among African American survivors, which is currently absent from the literature.

With regards to depression, given the high risk for depressive symptoms in women who have been diagnosed with TNBC, and the fact that when African American women breast cancer survivors are diagnosed with depression, it is much more severe; research is needed for development of culturally-relevant screening tools that can be used at intervals to detect depression in this high-risk population.

Strengths of the Study

This study had several unique strengths. First, this study provided data on a sample composed of entirely African American survivors, a relatively understudied cohort, with respect to the relationship of between biological and psychosocial processes and psychological functioning. Secondly, to date there has not been any research that has investigated the biological and psychological predictors, given the fact that breast cancer experience for many African American survivors may be uniquely different. Third, the development of the biopsychosocial model of breast cancer survivorship (Davis & Myers, 2008) for African American women is well suited to address salient biological and psychosocial risk factors that were used as a conceptual framework to undergird this study and future studies. Fourth, this study included women from age 25 and older who resided within Northern and Southern California, thereby including women from smaller bedroom communities, to large urban communities. Fifth, the sample size was a relatively credible size. Sixth, the findings facilitate a deeper understanding of the role of chronic stress among African American women. Seventh, the findings of this study contribute to an overall body of knowledge that addresses the breast cancer disparities among African American women.

Limitations of the Study

Several limitations were noted. First, though the sample size was credible, a larger sample size may have allowed the elucidation of findings that may have been masked, such as biological predictors. Second, though the goal was to target African American breast cancer survivors, coupled with the entire sample self-identifying as African American, African, African ancestry,

the findings should not be generalized to other women of various ethnic or racial backgrounds. Third, recognizing that African American women are a heterogeneous population with various subpopulations (with their unique perspective and cultural nuances) is of importance. To that end, women from a particular subgroup may not typify the findings. Fourth, geographically, our sample ranged from the West Coast and may not be generalized to other geographic areas. Fifth, there may also be limitations in using self-reported data as there is a risk that participants may have under- or over-reported (Manjer, Merlo, & Berglund, 2004). Sixth, future studies may also include testing for moderators (i.e., resilience) that may influence the outcomes. Despite the limitations, the strengths of this study outweigh the limitations.

SUMMARY

Breast cancer is a global epidemic among all women (and some men), with increasing mortality rates for African American women and increasing incidence and mortality rates among African American women between ages 35 to 45 (American Cancer Society (ACS), 2013) despite the rich abundance of research on this subject matter. Our research has pointed to several factors, chiefly biological and psychosocial predictors and their roles in the psychological functioning of African American women breast cancer survivors. An understanding of the unique interplay of these roles could assist in addressing the numerous breast cancer disparities that exist among women of African descent.

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