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A prospective longitudinal study of post-traumatic stress symptoms and its risk factors in newly diagnosed female breast cancer patients

Azizat Abiodun Lebimoyo^{1*} and Mumtaz Oladipupo Sanni²

Abstract

Background Post-traumatic stress symptoms are one of the most commonest, but un-recognized psychological morbidity found in female breast cancer patients. However, there are insufficient prospective studies concerning the trajectory of post-traumatic stress symptoms and their risk factors in Nigerian women living with breast cancer.

Objective To determine the changes in the prevalence and risk factors of post-traumatic stress symptoms among newly diagnosed female breast cancer patients across different timelines over 6 months.

Method This was a prospective longitudinal study of 183 newly diagnosed female breast cancer patients selected using a systematic random sampling method. The Six-Item Impact of Events Scale, Visual Analogue Scale of Pain, Functional Assessment of Cancer Therapy-Breast, and a Socio-Demographic questionnaire were administered to the participants.

Results The prevalence of post-traumatic stress symptoms was 46%, 31%, and 22% at baseline, 3 months, and 6 months respectively, indicating a decline in post-traumatic stress symptoms over time. In the final assessment at 6 months, identified risk factors of post-traumatic stress symptoms were: religiosity, accessibility to treatment, illness perception, chemotherapy, and quality of life.

Conclusion Post-traumatic stress symptoms are prevalent in newly diagnosed female breast cancer patients, there is a need for regular screening of these symptoms in these women to allow for early psycho-social intervention, and better treatment outcomes.

Keywords Post-traumatic stress symptoms, Breast cancer, Risk factors

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Background

Breast cancer occurs due to the uncontrolled division of different cells within the breast tissue, it is the commonest cancer found in women and may be considered a public health burden globally [1]. In Sub-Saharan Africa, breast cancer is guite prevalent and is one of the greatest causes of morbidity and mortality in females [2]. In Nigeria, a rising incidence of breast cancer has been observed among women, [3] deductively, the risk of morbidity and mortality secondary to



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breast cancer may be also raised [4]. Living with breast cancer could have a detrimental impact on mental health, resulting in various psychopathologies, including post-traumatic stress symptoms [5, 6].

Post-traumatic stress symptoms (PTSS) are symptoms seen in persons suffering from post-traumatic stress disorder, which is a mental illness that occurs secondary to exposure to a traumatic event, in which there is an imminent threat of death or severe injury [7]. These PTSS usually arise within 3 to 6 months of trauma exposure, but in some cases may manifest many years later. According to the 5th version of the Diagnostic Statistical Manual (DSM-5), [8] these PTSS can be divided into three main groups of symptoms; hyper-arousal (hyper-vigilance, enhanced startle reaction, insomnia), avoidance of situations and activities that are reminders of the traumatic event, and reexperiencing or having recurrent intrusive memories of the event. Other symptoms are as follows: intense feelings of fear, poor sleep, impaired concentration, self-destructive behavior, substance abuse, depressive/ anxiety symptoms, and emotional numbress [8].

Receiving a diagnosis of breast cancer and undergoing cancer treatment may be considered a traumatic and life-changing event, therefore placing affected females at risk for PTSS [9, 10]. With the advent of improved breast cancer screening and treatment, the population of breast cancer survivors is increasing by the day, therefore, causing the prevalence of breast cancer-related PTSS to rise exponentially [11]. The onset of PTSS may be at any point, from the time of receiving the diagnosis of breast cancer, to the completion of active cancer treatment [12].

Many variables play a crucial role in the onset and evolution of PTSS in female breast cancer patients, these include the following: prior history of physical trauma [13] childhood emotional abuse, [14] low socioeconomic status, [15] and advanced cancer stage [16]. The magnitude and risk factors of PTSS in female breast cancer patients vary across timelines of the cancer illness, which may inform some adjustments in the medical, and psycho-social management of these women at different points in time [17, 18]. However, most studies concerning PTSS and its risk factors are cross-sectional, [6, 19] with limited prospective studies in existence. Notably, there is a scarcity of both cross-sectional and prospective studies concerning the prevalence and risk factors of PTSS in Nigerian female breast cancer patients. This portrays a need for the examination of the burden of PTSS, and its associated risk factors among Nigerian female breast cancer patients, and this is the main objective of this study.

Methods

Study setting, participants, and design

This was a prospective longitudinal study conducted from February 2022 to August 2022 at the Oncology outpatient clinic of the Lagos State University Teaching Hospital (LASUTH). Participants were women attending the oncology clinic, and inclusion criteria were as follows: those aged \geq 18 years with a histologically confirmed diagnosis of breast cancer, and not more than 3 months post-diagnosis of early-stage breast cancer (stage 1 and stage 2). Women with advanced-stage breast cancer (stage 3 and stage 4), who were too physically ill to participate, and with a history of mental illness were excluded from the study. Participants were recruited using systematic random sampling of those who met the inclusion criteria.

Study instruments

Socio-demographic and clinical questionnaire

Participant characteristics such as age, marital status, level of education, employment status, monthly income, and level of religiosity were noted. Also, time since cancer diagnosis, cancer symptom duration, cancer treatment duration, form of cancer treatment received, stage of cancer, history of mental illness, and family history of mental illness were documented.

The Six-Item Impact of Event Scale (IES-6)

The Six-Item Impact of Event Scale (IES-6) is a brief screening tool for PTSS concerning a specific traumatic event [20]. This scale comprises two items each on the avoidance, hyper-arousal, and intrusion subscales respectively. The respondents are to indicate on a 4-point scale ranging from "never" (score = 0) to "extremely" (score = 4), how frequently each symptom was experienced in the past week. The score is calculated as the total score of the six items, and a cut-off score of 10 is efficient for detecting PTSS [21]. The IES-6 has shown good reliability and validity [22] and has been used in Nigeria [23].

Functional Assessment of Cancer Therapy-Breast (FACT-B)

The Functional Assessment of Cancer Therapy-Breast (FACT-B) is a self-reported instrument used to measure quality of life (QOL) in patients with breast cancer [24]. The FACT-B consists of 44 items divided into several subscales: physical well-being (PWB), emotional well-being (EWB), social well-being (SWB), functional well-being (FWB), breast cancer, and additional concerns subscale (BCS). Each item is rated on a 5-point rating scale ranging from 0 (not at all) to 4 (very much). The total score and the subscale scores for the dimension of

well-being are calculated with higher scores indicating higher quality of life. The FACT-B is easy to use, and its reliability and validity have been established with an internal consistency of > 0.70 for all its subscales and has been used in Nigeria [25].

Visual Analogue Scale of Pain (Pain-VAS)

The Visual Analogue Scale of Pain is a uni-dimensional measure of pain intensity and is in the form of a straight horizontal line of fixed length, usually 10 cm, with the ends of this line regarded as extreme limits of pain, from the left (worst) to the right (best). The patient marks on the line the point that they feel represents their current perception of their pain, and the score is determined by measuring in millimeters from the left-hand end of the line to the point that the patient marks. A higher score indicates greater pain intensity. In Nigeria, the Visual Analogue Scale of Pain was found to have a reliability of 0.7 [26].

Study procedure

At the baseline, a systematic random sampling method was used to select 228 participants who met the inclusion criteria. Being a prospective longitudinal study, these women were assessed using the above-listed study instruments at baseline and were followed up at 3 and 6 months, respectively.

Statistical analysis

Statistical analysis was done using the Statistical Package for the Social Sciences Version-23 (SPSS version-23). Descriptive statistics of the participants' characteristics were reported using means, standard deviations, frequencies, and percentages. The Friedman's Analysis of Variance (ANOVA) Test was done, and the Wilcoxon-Signed Rank Test was used as a post hoc test to determine the presence of a significant difference in PTSS scores across the three assessment points. The chi-square test of independence and Mann-Whitney U test were used accordingly to examine the association between socio-demographic variables, clinical variables, and PTSS. Logistic regression analysis was used to determine the variables independently associated with PTSS. All reported *p*-values were two-tailed, and a *p*-value < 0.05 was considered statistically significant.

Results

Of the 228 participants that were recruited at the baseline, due to various reasons such as death, poor physical health, and loss of interest in study participation, 3 and 45 participants were lost to follow-up at the 3rd and 6th month respectively. This gave a study completion rate of 98.6% (225) at 3 months, and 80.3% (183) at 6 months.

Socio-demographic profile

The mean age of the respondents was 53 (\pm 10) years, with almost a third falling within the age group of 25–47 years. The majority were married (54%), Christian (82%), had tertiary education as their highest level of schooling (63%), and close to two-thirds of the sample were employed (54%). Almost half (47%) viewed themselves as very religious, and over half of them (51%) said their access to cancer treatment was easy (Table 1).

Clinical profile

At baseline, the mean duration of symptoms, diagnosis, and treatment was 14 (\pm 6.4) months, 2.3 (\pm 0.7) months, and 1.4 (\pm 0.8) months respectively. Over twothirds of the sample had stage 2 cancer (61%). Most of them had received chemotherapy (82%) and had a negative perception of their cancer illness (60%) (Table 1).

Prevalence of post-traumatic stress symptoms

Using the IES-6, the prevalence of PTSS was reported as 46%, 31%, and 22% at baseline, 3 months, and 6 months, respectively. The highest mean score for Total PTSS was found at baseline, 10 (\pm 6), and over time, there was a decrease in PTSS among the participants (Table 2).

Comparison of post-traumatic stress symptoms across the assessment periods

An attempt was made to determine if there was a statistically significant difference in mean PTSS scores across the three assessment points. The Friedman's Analysis of Variance (ANOVA) test showed a statistically significant difference in the mean total PTSS scores across the assessment points ($x^2 = 10.1$, P = 0.01). A Wilcoxon-Signed rank test used as a post hoc test showed a statistically significant decrease in total PTSS scores from baseline to 6-month (Z = -2.63, P = 0.03), and from 3 to 6 months (Z = -10.14, P = 0.01). On a closer look at the subscales, Friedman's test found a statistically significant difference in hyper-arousal between the assessment points ($x^2 = 9.2$, P = 0.01). A post hoc test showed a statistically significant decrease in hyper-arousal between baseline and 3 months (Z = -3.31, P = < 0.001), and between baseline and 6 months (Z=3.70, P<0.001). However, there was no statistically significant difference in intrusion (x^2 =3.4, P=0.14) and avoidance (x^2 =1.1, P = 0.61) between the assessment points (Table 3).

Bivariate analysis of variables independently associated with PTSS

The chi-square test of independence was used as a bivariate analysis to determine the association between

Table 1 Socio-demographic and clinical profile

| Socio-demographic variable | Frequency <i>n</i> (%) Total <i>N</i> = 183 | Clinical variable | Frequency <i>n</i> (%) Total <i>N</i> = 183 |
|------------------------------------|--|--|--|
| Marital status | | Treatment form | |
| Single | 21(11) | Chemo only | 39(21) |
| Married | 98(54) | Surgery only | 32(18) |
| Divorced | 15(8) | Surgery + Chemotherapy | 73(40) |
| Separated | 4(2) | Surgery + Chemo + Radio | 34(19) |
| Widow | 45(25) | Chemo & Radio only | 3(2) |
| Education | | Illness perception | |
| Secondary | 68(37) | Negative | 110(60) |
| Tertiary | 115(63) | Positive | 73(40) |
| Religion | | Cancer stage | |
| Islam | 34(18) | Stage 1 | 71(39) |
| Christian | 149(82) | Stage 2 | 112(61) |
| Employment status | | Pain | |
| Unemployed | 46(25) | <4 (low) | 91(49) |
| Self-employed | 38(21) | 4–7 (moderate) | 54(30) |
| Employed | 99(54) | >7 (severe) | 38(21) |
| | | Mean (±SD)(Range) | 5(3)(0-10) |
| Treatment accessibility | | | |
| Not Easy | 70(38) | Treatment duration (months) | 1.4(0.8)(0.3–3) (Baseline) |
| Easy | 93(51) | Mean (±SD)(Range) | 4.4(0.8)(3.3–6) (3 months) |
| Very Easy | 20 (11) | | 7.4(0.8)(6.3–9) (6 months) |
| Religiosity | | | |
| None Little Moderate Very | 5(3) 31(17) 60(33) 86(47) | Symptom duration (months) Mean (± SD)(Range) | 14(6.4)(1–36) (Baseline) 17(7)(3–39) (3 months) 20(6.5)(6–42) (6 months) |
| Age (years) | | | |
| 25-47 48-56 57-60 >60 | 53(29) 52(28) 39(22) 39(22) | Time since diagnosis(months) Mean (± SD)(Range) | 2.3(0.7)(0.5–3) (Baseline) 5.3(0.7)(3.5–6.3) (3 months) 8.4(0.7)(6.5–9.3) (6 months) |
| Mean (±SD)(Range) | 53(10)(25-78) | | |
| Monthly income(Naira) | | | |
| < 25,000 | 49(27) | | |
| 25,000-50,000 | 43(24) | | |
| 51,000-100,000 | 62(34) | | |
| > 100,000 | 29(15) | | |
| Mean (±SD)(Range) | 81,662(84,900)(10,000– 500,000) | | |

SD standard deviation

socio-demographic variables, clinical variables, and PTSS among the participants. While the Mann–Whitney U test was done to determine the association between quality of life and PTSS. The following observations were made:

Regarding socio-demographic variables, at baseline, only education (P=0.02) was significantly associated with PTSS. At 3 months, education was no longer significant (P=0.30); however, age (P=0.01), monthly income (P < 0.001), and treatment accessibility (P=0.02) were significantly associated with PTSS. At 6 months, age (P < 0.001), monthly income (P < 0.001), and treatment accessibility (P < 0.001) continued to be significant, and religiosity (P < 0.001) was found to be significant for the first time. However, there was no significant association between marital status, employment status, and PTSS across the three assessment points (Table 4).

Table 2 Post-traumatic stress symptoms profile

| Variable | Baseline | 3 months | 6 months |
|----------------------------|----------|----------|----------|
| PTSS Present | | | |
| Yes | 84(46) | 57(31) | 40(22) |
| No | 99(54) | 126(69) | 143(78) |
| Total PTSS | | | |
| Mean(±SD) | 10(6) | 9(5) | 6.2(6) |
| Intrusion Mean(±SD) | 4(2.2) | 3.3(2.1) | 3.2(2.3) |
| Avoidance Mean(±SD) | 3(2) | 3(2.1) | 2.2(1.3) |
| Hyper-arousal Mean(±SD) | 4(2.4) | 3(2) | 2.2(2.1) |
| | | | |

SD standard deviation

For clinical variables, at baseline, illness perception was significant (P<0.001), but ceased to be significant at 3 months (P=0.44); however, treatment duration (P=0.01) was found to be significant at 3 months. At 6 months, illness perception became significant again (P<0.001), chemotherapy (P=0.04), and treatment duration (P=0.04) were also significantly associated with PTSS. Across the three assessment points, pain and time since cancer diagnosis were significantly associated with PTSS. There was no observable association between cancer stage, symptom duration, and PTSS (Table 5). Physical well-being (PWB) was significantly associated with PTSS at baseline (P=0.01) and 3 months (P<0.001), but was no longer significant at 6 months (P=0.06). On the other hand, functional well-being (FWB) (P=0.01) and breast cancer subscale (BCS) scores (P<0.001) were significant at baseline only. Across the three assessment points, total quality of life (Total QOL) (P<0.001) and emotional well-being (EWB) (P<0.001) were significantly associated with PTSS, but social well-being (SWB) had no association with PTSS (Table 6).

In summary, on bivariate analysis at 6 months, clinical variables such as pain, illness perception, chemotherapy, time since cancer diagnosis, treatment duration, total quality of life, and emotional well-being were significantly associated with PTSS. While age, monthly income, treatment accessibility, and religiosity were the socio-demographic variables significantly associated with PTSS.

Multivariate analysis of the relationship between independent variables and PTSS

The relationship between quality of life, socio-demographic variables, clinical variables, and PTSS was further investigated with the Logistic Regression model, and PTSS was made the dependent variable. Variables in the equation included all significant independent variables (P<0.05) at 6 months from the prior chi-square test and Mann–Whitney U test.

Table 3 Friedman's ANOVA test and post hoc test of difference between PTSS scores across timelines

| Friedmans ANOVA test | | | Post hoc test | | | | |
|--|------|---|-----------------------|-------------------|-----------------|--|--|
| Variable Mean rank Chi-square value (P-value) DF = 2 | | Chi-square value (P-value) DF = 2 | Variable | Wilcoxon- Z value | <i>P</i> -value | | |
| Total PTSS | | | Total PTSS | | | | |
| Baseline | 2.12 | 10.1 | Baseline and 3 months | -5.82 | 0.07 | | |
| 3 months | 2.03 | (0.01) | Baseline and 6 months | - 2.63 | 0.03 | | |
| 6 months | 1.84 | | 3 months and 6 months | - 10.14 | 0.01 | | |
| Hyper-arousal | | | Hyper-arousal | | | | |
| Baseline | 2.10 | 9.2 | Baseline and 3 months | - 3.31 | < 0.001 | | |
| 3 months | 2.05 | (0.01) | Baseline and 6 months | - 3.70 | < 0.001 | | |
| 6 months | 1.85 | | 3 months and 6 months | - 1.60 | 0.12 | | |
| Intrusion | | | | | | | |
| Baseline | 2.10 | 3.4 | | | | | |
| 3 months | 1.96 | (0.14) | | | | | |
| 6 months | 1.94 | | | | | | |
| Avoidance | | | | | | | |
| Baseline | 2.05 | 1.1 | | | | | |
| 3 months | 1.98 | (0.61) | | | | | |
| 6 months | 1.97 | | | | | | |

P-value level of significance

| Variable | PTSS Absent n (%) Baseline | PTSS Present n (%) Baseline | Df=1 Chi-square value (Sig) | PTSS Absent n (%) 3-months | PTSS Present n (%) 3-months | Df = 1 Chi-square value (Sig) | PTSS Absent n (%) 6-month | PTSS Present n (%) 6-months | Df = 1 Chi-square value (Sig) |
|----------------|-------------------------------------|--------------------------------------|-----------------------------------|----------------------------------|--------------------------------------|-------------------------------------|------------------------------------|--------------------------------------|-------------------------------------|
| Age (years) | | | | | | | | | |
| ≤50 | 58(58) | 42(42) | 0.22 | 51(51) | '49(49) | 5.14 | 42(42) | 58(58) | 12.9 |
| >50 | 51(61) | 32(39) | (0.64) | 56(68) | 27(32) | (0.02) | 57(69) | 26(31) | (<0.001) |
| Income (Naira) | | | | | | | | | |
| ≤ 50,000 | 54(57) | 40(43) | 0.36 | 46(47) | 52(53) | 11 (<0.001) | 42(43) | 56(57) | 9.8 (<0.001) |
| > 50,000 | 55(62) | 34(38) | (0.65) | 61(72) | 24(28) | | 57(67) | 28(33) | |
| Marital status | | | | | | | | | |
| Married | 53(54) | 45(46) | 0.13 | 67(72) | 26(28) | 3.31 | 71(73) | 26(27) | 0.23 |
| Unmarried | 46(54) | 39(46) | (0.37) | 59(66) | 31(34) | (0.07) | 72(84) | 14(16) | (0.08) |
| Education | | | | | | | | | |
| Tertiary | 65(58) | 48(42) | 5.74 | 81(70) | 34(30) | 1.06 | 88(74) | 31(26) | 1.39 |
| Secondary | 34(49) | 36(51) | (0.02) | 45(66) | 23(34) | (0.30) | 55(86) | 9(14) | (0.24) |
| Employment | | | | | | | | | |
| Unemployed | 25(54) | 21(46) | 1.47 | 30(64) | 17(36) | 0.15 | 44(94) | 3(6) | 0.14 |
| Employed | 74(54) | 63(46) | (0.23) | 96(71) | 40(29) | (0.70) | 99(73) | 37(27) | (0.97) |
| Religiosity | | | | | | | | | |
| High | 51(74) | 18(26) | 0.06 | 53(73) | 20(27) | 0.04 | 67(80) | 17(20) | 18 |
| Not high | 48(42) | 66(58) | (0.82) | 73(66) | 37(34) | (0.85) | 76(77) | 23(23) | (<0.001) |
| Treatment acce | SS | | | | | | | | |
| Not easy | 22(37) | 38(63) | 1.70 | 44(63) | 26(37) | 5.71 | 56(75) | 19(25) | 11 |
| Easy | 77(63) | 46(37) | (0.20) | 82(73) | 31(27) | (0.02) | 87(81) | 21(19) | (<0.001) |

Table 4 Chi-square test of association between socio-demographic variables and PTSS

Sig level of significance, n frequency

For socio-demographic variables, at baseline, tertiary education (P=0.01) was associated with a reduced risk of PTSS. At 3 months, with increasing age (P=0.02), the risk of PTSS was elevated. At 6 months, the final assessment point, age, and tertiary education were no longer significant; however, high religiosity (P=<0.001) and easy treatment access (P=<0.001) were protective against PTSS (Table 7).

Concerning clinical variables, at baseline, with every increase in EWB (P=0.02), BCS (P=<0.001), and Total QOL score (P = < 0.001), the risk of PTSS was reduced. On the other hand, negative illness perception (P = < 0.001) was associated with higher PTSS scores. At 3 months, with increasing EWB ($P = \langle 0.001 \rangle$) and PWB (P=0.04) scores, the risk of PTSS was reduced, but the BCS score, total QOL score, and negative illness perception ceased to be significant. Also, at 3 months, PTSS risk was raised with increasing time since cancer diagnosis (P=0.01). At 6 months, the final assessment point, receipt of chemotherapy (P=0.03) was associated with a threefold risk of PTSS, negative illness perception (P=0.01) became significant again and was predictive of PTSS, but time since cancer diagnosis was no longer significant. However, EWB was the only quality of life subscale that maintained a significant association with PTSS (P = < 0.001), meaning, with increasing EWB, PTSS risk was reduced by twofold (Table 7).

In summary, religiosity and treatment access were the socio-demographic risk factors for PTSS. While clinical risk factors for PTSS were chemotherapy, illness perception, and emotional well-being.

Discussion

Post-traumatic stress symptoms decreased progressively over time, with prevalence rates of 46, 31, and 22% at baseline, 3 months, and 6 months respectively. This suggests that at the end of six months, about one in every five newly diagnosed female breast cancer patients had PTSS. The 22% PTSS prevalence found at 6 months is in line with rates of 20–26.9% reported in past studies of female breast cancer patients [27–31]. However, higher PTSS rates of 35% [32] and 81.4% [33] have also been found previously. Conversely, lower PTSS rates of 4–4% have been documented in women with breast cancer [19, 34–37]. The disparity in PTSS prevalence between this present study and earlier studies may be due to methodological differences in geographical location, sample size, sampling procedure, and PTSS screening instruments.

| Variable | PTSS absent n (%) Baseline | PTSS present n (%) Baseline | Df = 1 Chi-square value (Sig) | PTSS absent n (%) 3 months | PTSS present n (%) 3 months | Df = 1 Chi-square value (Sig) | PTSS absent n (%) 6 months | PTSS present n (%) 6 months | Df = 1 Chi-square value (Sig) |
|-------------------------|--|--|--|--|--|--|---|---|--|
| Pain | | | | | | | | | |
| ≤5 | 80(70) | 35(30) | 12 (<0.001) | 65(69) | 29(31) | 8.2 (<0.001) | 72(67) | 35(33) | 16.7 (<0.001) |
| >5 | 29(43) | 39(67) | | 42(47) | 47(53) | | 27(36) | 49(64) | |
| Treatment duration | ≤1 month 49(52) >1 month 50(57) | ≤ 1 month 46(48) > 1month 38(43) | 0.33 (0.56) | ≤4months 75(79) >4months 51(58) | ≤4months 20(21) >4months 37(42) | 7.2 (0.01) | ≤7months 78(82) >7months 65(74) | ≤7months 17(18) >7months 23(26) | 3.3 0.04 |
| Symptom duration | ≤ 12months 59(57) > 12months 40(63) | ≤ 12months 44(43) > 12months 40(37) | 0.69 (0.40) | ≤ 15months 75(73) > 15months 51(64) | ≤ 15months 28(27) > 15months 29(36) | 0.14 (0.71) | ≤ 18months 100(97) > 18months 43(54) | ≤ 18months 3(3) ^a > 18months 37(46) | 1.24 (0.34) |
| Time since diagnosis | ≤ 2months 64(68) > 2months 35(39) | ≤ 2months 30(32) > 2months 54(61) | 4.4 (0.04) | ≤5months 76(81) >5months 50(56) | ≤5months 18(19) >5months 39(44) | 10 (<0.001) | ≤8 months 58(62) >8months 41(46) | ≤8 months 36(38) >8months 48(54) | 4.5 (0.04) |
| Cancer stage | • | | | | | | | | |
| Stage 1 | 38(56) | 30(44) | 0.06 | 50(73) | 25(33) | 1.67 | 56(75) | 19(25) | 0.14 |
| Stage 2 | 61(53) | 54(47) | (0.81) | 76(70) | 32(30) | (0.20) | 87(81) | 21(19) | (0.07) |
| Illness perce | ption | | | | | | | | |
| Poor | 14(32) | 30(68) | 11.4 | 24(63) | 14(37) | 0.60 | 30(75) | 10(25) | 12 |
| Not poor | 85(61) | 54(39) | (<0.001) | 102(70) | 43(30) | (0.44) | 113(79) | 30(21) | (<0.001) |
| Treatment | | | | | | | | | |
| With chemo | 87(58) | 64(42) | 3.80 | 108(71) | 44(29) | 3.35 | 119(78) | 33(22) | 4.3 |
| Without chemo | 12(37) | 20(63) | (0.05) | 18(58) | 13(42) | (0.07) | 24(77) | 7(23) | (0.04) |

| Table 5 | Chi-square test of association | between clinical variables and PTSS |
|---------|--------------------------------|-------------------------------------|
| | | |

^a Fisher's exact value

Sig level of significance, n frequency

| Tab | e 6 | Mann- | -Whitney (| J test of | fassociation | between | quality o | f life and | PTSS |
|-----|-----|-------|------------|-----------|--------------|---------|-----------|------------|------|
|-----|-----|-------|------------|-----------|--------------|---------|-----------|------------|------|

| Variable | PTSS absent Mean Rank (Median) Baseline | PTSS present Mean Rank (Median) Baseline | Df=1 MWU Value Z (Sig) | PTSS absent Mean Rank (Median) 3 months | PTSS present Mean Rank (Median) 3 months | Df=1 MWU Value Z (Sig) | PTSS absent Mean Rank (Median) 6 months | PTSS present Mean Rank (Median) 6 months | Df=1 MWU Value Z (Sig) |
|------------------------|---|--|---------------------------------|---|--|------------------------------------|---|--|------------------------------------|
| Physical Well-Being | 124(21) | 100(18) | 4913–2.67 0.01 | 110(12) | 117.2(14) | 6760–0.83 <0.001 | 88.4(21) | 96.3(19) | 3801–1.26 0.06 |
| Social Well-Being | 119(16) | 108(14) | 5581–1.30 0.20 | 114.2(18) | 111.4(17) | 6007–0.31 0.76 | 89(16) | 96(14) | 3839–0.89 0.37 |
| Emotional Well-Being | 133(20) | 86(13) | 3647–5.29 <0.001 | 125(14) | 96.3(11) | 4584–3.28 <0.001 | 110(13) | 71.4(10) | 2429–4.86 <0.001 |
| Functional Well-Being | 125(13) | 99(11) | 4831–2.84 0.01 | 119.2(13) | 104.4(13) | 5345–1.69 0.09 | 98(19) | 85(13) | 3551–1.71 0.07 |
| Breast Cancer Subscale | 133(26) | 87(23) | 3716–5.15 <0.001 | 109(22) | 119.3(23) | 5570–1.30 0.20 | 98.1(20) | 84.8(21) | 3557–1.69 0.08 |
| Total Quality of Life | 132(94) | 88(76) | 3785–4.91 <0.001 | 124(79) | 98.3(75) | 4775–2.57 <0.001 | 100(80) | 83(71) | 3412–2.09 <0.001 |

Sig level of significance, n frequency, MWU Mann-Whitney U value

| Variable | В | S.E | Wald | DF = 1 Sig | Odds ratio | 95% confidence interval |
|-----------------------------|--------|------|-------|---------------|------------|-------------------------------|
| Baseline | | | | | | |
| Negative illness perception | 1.54 | 0.43 | 12.64 | < 0.001 | 1.22 | 1.1-2.5 |
| Tertiary education | - 1.10 | 0.39 | 7.89 | 0.01 | 0.33 | 0.12-0.72 |
| EWB | -0.08 | 0.03 | 5.95 | 0.02 | 0.74 | 0.62-0.83 |
| BCS | -0.13 | 0.04 | 11.11 | < 0.001 | 0.63 | 0.62-0.76 |
| Total QOL | -0.40 | 0.01 | 14.04 | < 0.001 | 1.35 | 1.29–1.58 |
| 3 months | | | | | | |
| Age | -0.06 | 0.02 | 5.60 | 0.02 | 0.75 | 0.50-0.89 |
| Time since diagnosis | 0.88 | 0.34 | 6.78 | 0.01 | 2.41 | 1.24-4.67 |
| PWB | - 0.08 | 0.04 | 4.31 | 0.04 | 1.28 | 1.21-1.35 |
| EWB | -0.15 | 0.05 | 8.83 | < 0.001 | 2.02 | 1.78-2.08 |
| 6 months | | | | | | |
| High Religiosity | - 1.59 | 0.40 | 15.62 | < 0.001 | 5.20 | 2.23-10.8 |
| Treatment Access | -1.34 | 0.39 | 12.20 | < 0.001 | 0.26 | 0.12-0.57 |
| Chemotherapy | 0.98 | 0.46 | 4.57 | 0.03 | 2.66 | 1.28-6.52 |
| Negative Illness Perception | 1.13 | 0.41 | 7.63 | 0.01 | 0.32 | 0.14-0.72 |
| EWB | -0.31 | 0.07 | 18.23 | < 0.001 | 2.32 | 2.12-2.65 |

 Table 7
 Regression Analysis Showing the Predictors of PTSS

B co-efficient constant, S.E. standard error, Wald Wald chi-square, Df degree of freedom, Sig level of significance

The decline in PTSS observed over time is identical to outcomes from earlier prospective studies of female breast cancer patients [5, 18, 29, 38]. The gradual fall in PTSS could be attributed to the possibility that with time, newly diagnosed women may overcome the initial shock of a cancer diagnosis. This may be due to their ability to develop enduring coping mechanisms against the physical and emotional impact of breast cancer, and cancer treatment, resulting in curtailed PTSS risk. It is expedient that routine screening for PTSS is incorporated into the management of female breast cancer patients at the oncology out-patient clinics, to ensure its early detection and treatment.

High religiosity was associated with reduced PTSS risk, this was corroborated by Charlson et al. [39]. Despite the paucity of data concerning the relationship between religiosity and PTSS, quite several studies have found a negative relationship between psychiatric morbidity in general, and level of religiosity in breast cancer patients [40–42]. Religion has always played an important role in people's lives, giving them something to believe in, and helping maintain mental health during trying times [43–45]. Most people passing through stressful or traumatic circumstances turn to religion for healing, comfort, and succor [42]. Nigerians are quite religious, with women constituting the major chunk of worshippers at prayer houses, churches, mosques, and traditional worship centers in Nigeria [46]. For a

woman, having a cancer diagnosis could be perceived as life-threatening, bringing to fore the realization of the impermanence of life, uncertainty about the future, and of course, the fear of death. Deductively, female breast cancer patients may be propelled to apply religiosity in dealing with the stress of cancer, this could ameliorate the psychological impact of the illness, thereby reducing PTSS risk. Physicians may need to collaborate with clerics in the care of female breast cancer patients who consider religion an integral part of their lives, as this may make their treatment process more bearable, and possibly improve treatment outcomes.

Easy cancer treatment access was protective against PTSS. Although there was limited evidence regarding the relationship between treatment access and PTSS in female breast cancer patients, some studies posit that difficult treatment access due to long travel distance to the hospital is linked to under-utilization of breast cancer treatment services, [47–49] thereby amplifying the risk of psychiatric morbidity in the long term. In Nigeria, limitations like inadequate cancer treatment centers, bad roads, and exorbitant transport fares may hinder cancer treatment access, consequently escalating the likelihood of psychopathology like PTSS, in female breast cancer patients. In Nigeria, the establishment of more cancer treatment centers, especially within the rural areas, and an upgraded transport network system, is required. Ultimately, this would translate to easier cancer treatment access and lesser PTSS risk in breast cancer patients.

Chemotherapy was a predictor of PTSS, this is corroborated by other studies [50–52]. Chemotherapy sessions may be considered traumatic due to their numerous debilitating side effects, including pain, fatigue, vomiting, and hair loss. It is likely that women on chemotherapy may harbor a perpetual dread of this treatment and proceed to develop key symptoms of PTSS such as intrusion, avoidance, and hyper-arousal about chemotherapy sessions. This indicates that additional medical, physical, and emotional support, should be given to female breast cancer patients on chemotherapy.

Negative illness perception was associated with higher PTSS risk, this has been established previously [53]. Our findings give credence to research that proposes that negative illness perception may cause increased mental health morbidity in breast cancer patients [6, 54]. Illness perception could be concerning the cause, complications, or treatment of illness [55]. Also, illness perception is connected to mental health outcomes and plays a major role in determining a sense of well-being, self-management, and satisfaction with treatment experience [56, 57]. For a woman living with breast cancer, a negative illness perception due to fear of cancer complications, or cancer recurrence, could cause mental distress. Therefore, physicians need to focus on improving therapeutic alliance with female breast cancer patients, engage in continuous patient health education, and optimize patients' cancer treatment, hopefully, this may engender a favorable illness perception in these women.

Emotional well-being (EWB) was a predictor of PTSS, the higher the EWB, the lesser the PTSS risk, and vice versa. This observation is in tandem with studies that found an inverse relationship between quality of life and PTSS in female breast cancer patients [7, 58]. Emotional well-being (EWB) is a significant component of healthrelated quality of life, it refers to the capacity of an individual to produce positive emotions, and thoughts, and navigate stressful circumstances [59]. Having a high level of EWB helps a person cope with the challenges of daily living and maintain healthy relationships with others [59]. For obvious reasons, it is unsurprising that elevated levels of EWB would lower the likelihood of PTSS in women dealing with breast cancer. Female breast cancer patients should be encouraged to engage in EWB-promotional activities like joining cancer support groups, exercise, recreation, eating a healthy diet, and adopting a positive mindset, in time, this may diminish PTSS risk.

Implications for clinical practice

Physicians may need to adapt mandatory PTSS screening into the management of female breast cancer patients, and those with psychopathology should be referred for specialist care. Also, supplementary emotional support should be provided for women with low religiosity, negative illness perception, difficult cancer treatment access, and those on chemotherapy, due to their increased PTSS risk.

Implications for policy

Our findings provide comparable data on PTSS and its risk factors for other sub-Saharan African populations of female breast cancer patients, this may be of great importance to agencies responsible for the provision of oncology services for cancer patients in the sub-region. Furthermore, this study justifies the need for the formulation of policies that encourage the creation of more cancer treatment centers, especially in rural and suburban areas, to improve cancer treatment access.

Implications for future research

Prospective studies of the pattern and predictors of suicidality, substance use disorder, and adjustment disorder, in the wake of breast cancer diagnosis and treatment, would be informative.

Strengths and limitations

In Nigeria, most mental health studies of cancer patients were cross-sectional and involved mixed-cancer sites in both males and females; therefore, the prospective nature of this study, and its exclusivity to female breast cancer patients is unique. The absence of a control group was a limitation, as this would have strengthened the study findings. This study was also limited by the use of selfreporting questionnaires which depend on the honesty of the participants who complete them.

Conclusion

The findings of this study further contribute to the growing body of evidence that PTSS is a common mental health problem experienced by women living with breast cancer. Health-care professionals should have a high index of suspicion for PTSS in female breast cancer patients, most especially, in those with identified risk factors for PTSS.

Abbreviations

| PTSS | Post-traumatic stress symptoms |
|-----------|--------------------------------|
| Total QOL | Total quality of life |
| EWB | Emotional well-being |
| PWB | Physical well-being |
| SWB | Social well-being |
| FWB | Functional well-being |
| ANOVA | Analysis of variance |

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Authors' contributions

A.A.L collected, analyzed, and interpreted the participants' data. M.O.S and A.A.L were major contributors in writing the manuscript, and both authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

All procedures implemented in this work complied with the ethical standards on research and human experimentation of the Helsinki Declaration of 1975, as amended in 2013. Ethical approval for this study was obtained from the research and ethics committee of the Lagos State University Teaching Hospital, Nigeria (LREC/06/10/1768). Informed consent was received from the study participants and archived.

Consent for publication

Consent for the publication of data derived from this study was obtained from the study participants.

Competing interests

None.

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