Received: 14 February 2022 | Revised: 11 August 2022 | Accepted: 24 August 2022

DOI: 10.1002/pon.6026

ORIGINAL ARTICLE

WILEY

Assessment of anxiety/depression among cancer patients before and during the COVID-19 pandemic

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Funding information

Division of Intramural Research, National Institute on Minority Health and Health Disparities, Grant/Award Number: ZIA MD000015; National Institutes of Health

Abstract

Objective: To assess differences in the prevalence of anxiety/depression symptoms among cancer patients before (2019) and during the COVID-19 pandemic (2020); and the associations between anxiety/depression and sociodemographic and health behavior factors among cancer patients before and during the pandemic.

Methods: We analyzed data from the 2019 (n = 856) and 2020 (n = 626) Health Information National Trends Survey, a nationally representative survey of United States adults aged ≥18 years. Only adults with a cancer diagnosis were used in the analyses. Anxiety/depression was assessed using the Patient Health Questionnaire-4 (low/none [0–2], mild [3–5], moderate [6–8], and severe [9–12]) and dichotomized as low/none and current anxiety/depression (mild/moderate/severe). Multivariate analysis was performed.

Results: The prevalence of anxiety/depression symptoms among cancer patients was 32.7% before the COVID-19 pandemic and 31.1% during the pandemic. The odds of anxiety/depression among patients with fair/poor health status was higher during the pandemic relative to before (before: odds ratio [OR] = 1.85 vs. during: OR = 3.89). Participants aged 50–64 years (before: OR = 0.29, 95% confidence interval [95% CI] = 0.11–0.76; during: OR = 0.33, 95% CI = 0.11–0.97) and ≥65 years (before: OR = 0.13, 95% CI = 0.05–0.34; during: OR = 0.18, 95% CI = 0.07–0.47) had lower odds of anxiety/depression before and during the pandemic compared to those aged 35–49 years. Hispanics/Latinos had higher odds of anxiety/depression (OR = 2.70, 95% CI = 1.11–6.57) before the pandemic and lower odds of anxiety/depression during the pandemic (OR = 0.2, 95% CI = 0.05–1.01) compared to non-Hispanic Whites. Those who completed high school (before: OR = 0.08, 95% CI = 0.01–0.42), some college (before: OR = 0.10, 95% CI = 0.02–0.42), ≥college degree had lower odds of anxiety/depression symptoms (before: OR = 0.05, 95% CI = 0.01–0.26; during: OR = 0.06, 95% CI = 0.01–0.61) compared to those with less than a high school education.

Conclusion: Our results suggest the need to increase the provision of mental health services to cancer patients at high risk of developing anxiety/depression symptoms, particularly during public health emergencies, to alleviate further health burdens.

KEYWORDS
anxiety, cancer, COVID-19, depression, mental health, oncology, pandemic

1 | BACKGROUND

COVID-19 was designated as a pandemic on 11 March 2020 by the World Health Organization.[1] Although government-led social distancing and stay-at-home measures slowed the spread of the virus in certain areas, the measures also had negative implications on mental health.[2–4] For example, anxiety and other psychiatric problems have increased during the COVID-19 pandemic and COVID-19-related fear and anxiety (COV-FA) may have risen due to lockdowns, the absence of a cure, scarce supply of vaccines, and an unknown end date for the pandemic.[5–7] Cancer patients are especially vulnerable to contracting COVID-19 and experiencing severe COVID-19 symptoms.[8] This elevated risk for infection has, in turn, been shown to play a role in elevated COV-FA and COVID-19-related depression among breast cancer patients.[9] In fact, COV-FA predicted fear, depression, and anxiety symptoms among a German cancer patient cohort.[10] Additionally, delays of cancer treatment (63% reported experiencing barriers to continuing treatment) and closing of clinics during the pandemic may have further compounded the risk of psychiatric symptoms.[11,12] Furthermore, recent studies indicated the global prevalence of depression and anxiety among cancer patients is 23%–50% and 17%–69%, respectively; which may be higher than the global prevalence of depression (33.7%) and anxiety (31.9%) among the general population.[12–16]

Currently, there are over 16.9 million cancer survivors in the United States (US) and this number is projected to increase to 26.1 million by 2040.[17] The prevalence of major depressive disorders prior to the pandemic was estimated to be between 0% and 38% among cancer patients.[18] Studies predating the pandemic showed higher depression and anxiety among US cancer patients than among both the general inpatient population and the general public.[19,20] Additional studies have found higher odds of depression among cancer patients than among the general population and a higher likelihood of emotional and physical distress among cancer patients.[21–23] Walker et al. not only found major depression to be common among cancer patients but also most cancer patients with depression were not adequately treated.[24] Unmet needs in treatment can have adverse consequences. For example, Pitman et al. found poor recognition of anxiety and depression to be associated with reduced quality of life and survival.[25] Further, geographic differences in depression and anxiety diagnosis and therapy for cancer patients suggest these issues are sometimes under-recognized, especially in areas outside urban centers.[25] Elevated rates of depression and anxiety among oncology patients may be explained by the biopsychosocial model (interdependent biological, psychological, and social variables) or by the neuropsychiatric model (depression/anxiety arising as a consequence of some malignancies and their therapies).[26–28]

Given the inherent threat and stress that accompanies cancer diagnosis and treatment, it is understandable that patients with cancer frequently experience anxiety. Cancer medications may also contribute to psychiatric morbidity among cancer patients. For instance, high-dose corticosteroids may induce hypomania and depression at low levels over an extended period, and mood problems have been observed in 37% of patients treated with buparlisib.[29,30] While anxiety and depression are major health problems that are often associated with cancer diagnoses, further research is needed to understand the effect of the pandemic on the prevalence and burden of anxiety/depression before and during the COVID-19 on cancer patients. This study seeks to: (1) estimate differences in the prevalence of anxiety/depression among cancer patients before (2019) and during the COVID-19 pandemic (2020); and (2) determine the association between anxiety/depression and sociodemographic (e.g., race/ethnicity, sex, sexual orientation, age, annual income, etc.) and health behavior (e.g., smoking status, physical activity) factors among cancer patients before and during the COVID-19 pandemic. We hypothesized the prevalence of anxiety/depression would be higher during the pandemic relative to before the pandemic. Our findings will provide important information on (1) COVID-19 pandemic-related anxiety and depression issues faced by cancer patients; and (2) subgroups of cancer patients who might be at increased risk for depression/anxiety during the ongoing COVID-19 pandemic, and (3) information for addressing mental health during future public health emergencies.

2 | METHODS

2.1 | Study population and data

The de-identified data was obtained from the 2019 and 2020 Health Information National Trends Survey (HINTS).[31,32] HINTS is a nationally representative, annual cross-sectional survey of the non-institutionalized US adult population. HINTS includes 9303 adults (Cycle 3 [n = 5438] and Cycle 4 [n = 3865]) who completed the survey before (Cycle 3, January through April 2019) and during (Cycle 4, February through June 2020) the COVID-19 pandemic. The survey assesses health-related information and behaviors, including anxiety/depression and cancer diagnosis. There were 1482 cancer patient participants identified by asking the participants if they have

ever been diagnosed with cancer. However, we conducted a complete case analysis on a total sample of 1434 adult cancer patients who completed the anxiety/depression surveys. The various types of cancer diagnosis can be found in the HINTS codebook on the website (https://hints.cancer.gov). Detailed data collection methodology for HINTS is described elsewhere.[32,33] The HINTS de-identified data are publicly available on the National Cancer Institute (NCI) website (https://hints.cancer.gov), therefore Institutional Review Board approval was not required for this study.

2.2 | Measures

2.2.1 | Dependent variable

The dependent/outcome variable was current anxiety/depression status. This was derived from the Patient Health Questionnaire-4 (PHQ-4). The total scores of PHQ-4 range from 0–12.[34,35] Scores are used to assess symptoms/signs of anxiety/depression, which are categorized as low/none (0–2), mild (3–5), moderate (6–8) and severe (9–12).[34,35] In Tables 2 and 3, we dichotomized anxiety/depression symptoms status into low/none anxiety/depression and current anxiety/depression (mild/moderate/severe) because of small sample sizes within the four categories.

2.2.2 | Independent variables

The HINTS survey conducted in 2019 was categorized as the survey before the COVID-19 pandemic, while the survey conducted in 2020 was coded as the survey during the COVID-19 pandemic. Sociodemographic characteristics were chosen for analysis based on their association with anxiety/depression among cancer patients or the general population in previous studies.[36–38] These sociodemographic characteristics include self-reported sexual orientation (heterosexual [Reference (Ref.)], lesbian/gay, and bisexual) and race/ethnicity (non-Hispanic White [Ref.], non-Hispanic Black/African American, Hispanic/Latino, non-Hispanic Asian, and non-Hispanic other), which were included in this study as primary independent variables. We recoded sexual orientation to two groups (i.e., heterosexual [Ref.] and lesbian/gay/bisexual) for our analysis due to limited samples in the sexual orientation subgroups.

The rest of the variables include self-reported age (18–25, 26–34, 35–49 [Ref.], 50–64, and ≥65. Individuals aged 35–49 years we used as a reference because they tend to have higher prevalence of anxiety/depression symptoms.[39] Sex was categorized as (male [Ref.] or female); level of education completed (<high school [Ref.], high school graduate, some college, or college graduate or higher), marital status (single/never been married, married, living as married/living with a romantic partner, separated, divorced, or widowed), total annual family income (<$20,000, $20,000–$34,999, $35,000–$49,999, $50,000–$74,999 [Ref.], or ≥$75,000); health insurance (no or yes [Ref.]), general health status (excellent, very good, good, fair or poor), US census region (Northeast [Ref.], Midwest, West, or South); number of days per week of moderate physical activity intensity (none or at least 1 day per week [Ref.]); and cigarette smoking status (non-smoker [Ref.], former smoker, and current smoker). Due to limited samples with subgroups, we regrouped marital status (single/never been married [Ref.], married/living as married/living with a romantic partner, separated/divorced, or widowed); general health status (excellent/very good/good [Ref.] or fair/poor); and body mass index (BMI) (<18.5, 18.5–24.9, 25.0–29.9, and ≥30.0); Reference group for BMI is 18.5–24.9.

2.3 | Statistical analysis

To offset non-response bias and achieve nationally representative estimates, we weighted the analyses by incorporating the HINTS sampling weight in the analytical procedures.[31,32] We first calculated the statistical difference and relative/odds ratio (OR) of the four categories of anxiety/depression among cancer patients during and before the COVID-19 pandemic, to determine the absolute and relative differences of anxiety/depression status categories during and before the pandemic. Next, to assess differences in the outcome by surveys before and during the COVID-19 pandemic, we estimated the prevalence of the binary anxiety/depression variable by sociodemographic characteristics and health behaviors (i.e., BMI status, moderate physical activity intensity, and cigarette smoking status) among cancer patients. Further, we conducted a bivariate χ^2 analysis to evaluate the associations between anxiety/depression status and sociodemographic characteristics and health behaviors among cancer patients before and during the pandemic. Finally, we used multivariable logistic regression to estimate ORs and 95% confidence intervals (CIs) for the association of anxiety/depression status in cancer patients with sociodemographic characteristics, BMI status, and moderate physical activity intensity by surveys before (Model I) and during (Model II) the COVID-19 pandemic. Smoking status was dropped from the models due to small samples within each category. The multivariable analysis was conducted using complete cancer cases. Statistically significant results were reported at p-value <0.05 for 2-sided inference test. We performed analyses using STATA/SE 16.1.

3 | RESULTS

3.1 | Prevalence of anxiety/depression symptoms by severity

Table 1 presents the prevalence, absolute and relative differences in anxiety/depression symptoms among cancer patients. The prevalence of severe anxiety/depression symptoms was higher during the COVID-19 pandemic (5.53%, 95% CI = 3.37%–8.96%) than before the pandemic (5.25%, 95% CI = 3.14%–8.63%). The prevalence of mild anxiety/depression symptoms was 0.43% higher during the pandemic relative to before the pandemic. Compared to before the

TABLE 1 Prevalence of anxiety/depression status in United States (US) adult cancer patients before and during the COVID-19 pandemic (Unweighted $n = 1434$)

	n Percent (95% CI)		Difference	
Anxiety/depression symptoms	Before COVID-19 pandemic	During COVID-19 pandemic	Absolute, %	Relative/Odds ratio
None	67.33 (60.98–73.09)	68.91 (62.07–75.02)	1.58	1.02
Mild	20.49 (14.97–27.41)	20.92 (15.93–26.96)	0.43	1.02
Moderate	6.93 (4.73–10.05)	4.64 (2.70–7.85)	2.29	0.67
Severe	5.25 (3.14–8.63)	5.53 (3.37–8.96)	0.28	1.05

Note: 2019 and 2020 Health Information National Trends Surveys, HINTS 5 Cycles 3 and 4 respectively. Unweighted $N = 1434$; Weighted $N = 45{,}063{,}113$. Before the COVID-19 pandemic data (HINTS 5 Cycles 3) were collected January through April 2019, and during COVID-19 pandemic data were collected from February through June 2020.

pandemic, the prevalence was 1.02-fold higher for mild anxiety/depression and 1.05-times higher during the pandemic among cancer patients who reported severe anxiety/depression symptoms.

3.2 | Prevalence of binary anxiety/depression symptoms among cancer patient population

The prevalence of anxiety/depression symptoms among cancer patients was, in general, higher before the pandemic (32.7%) than during the pandemic (31.1%). The distribution of anxiety/depression symptoms by sociodemographic factors and health behaviors, however, was different (Table 2). The prevalence of anxiety/depression was higher during the pandemic relative to before the pandemic for those aged 26–34 (before = 46.6% vs. during = 48.5%), 50–64 (before = 29.2% vs. during = 30.1%), and ≥65 (before = 23.8% vs. during = 25.5%), but decreased for those aged 18–25 (before = 95.2% vs. during = 16.1%) and 35–49 (before = 62.3% vs. during = 49.7%). The prevalence of anxiety/depression symptoms was higher among female respondents than male (before: female [35.4%] vs. male [28.9%]; during: female [36.2%] vs. male [23.0%]) before and during the pandemic. Non-Hispanic White (before = 26.1% vs. during = 31.2%) and Non-Hispanic Asian (before = 1.9% vs. during = 27.1%) individuals had a higher prevalence of anxiety/depression symptoms, whereas non-Hispanic Black/African American (before = 63.2% vs. during = 19.1%), Hispanic/Latino (before = 56.8% vs. during = 33.6%) and non-Hispanic other (before = 60.4% vs. during = 3.3%) individuals had a lower prevalence during relative to before the pandemic.

3.3 | Odds of anxiety/depression among cancer patients

Patients aged 50–64 (before: OR = 0.29, 95% CI = 0.11–0.76 vs. during: OR = 0.33, 95% CI = 0.11–0.97) and ≥65 (before: OR = 0.13, 95% CI = 0.05–0.34 vs. during: OR = 0.18, 95% CI = 0.07–0.47) had lower odds of experiencing anxiety/depression symptoms compared to those aged 35–49 years old. Hispanics/Latinos, compared to non-Hispanic Whites before the pandemic, had 2.7-fold higher odds of experiencing anxiety/depression symptoms (OR = 2.70, 95% CI = 1.11–6.57). Before the pandemic, people who had completed high school (OR = 0.08, 95% CI = 0.01–0.42), some college (OR = 0.10, 95% CI = 0.02–0.42), or college degree/higher (OR = 0.05, 95% CI = 0.01–0.26) education had lower odds of experiencing anxiety/depression symptoms compared to those who had less than high school education. Compared to <high school education during the pandemic, people with ≥college degree education had decreased odds of experiencing anxiety/depression symptoms (OR = 0.06, 95% CI = 0.01–0.61). During the pandemic, having fair/poor general health was also associated with higher odds of anxiety/depression symptoms (OR = 3.89, 95% CI = 1.39–10.87) compared with people with excellent/very good/good general health. Relative to Northeast individuals, those who lived in the Midwest (OR = 3.39, 95% CI = 1.35–8.48) or the South (OR = 3.75, 95% CI = 1.55–9.09) had higher odds of anxiety/depression symptoms before the pandemic. Individuals with a BMI of ≥30.0 had 59% decreased odds of anxiety/depression symptoms during the pandemic (OR = 0.41, 95% CI = 0.18–0.96) compared to those with a BMI of 18.5–24.9. See Table 3.

4 | DISCUSSION

To our knowledge, this is the first study to examine the association between anxiety/depression among cancer patients before and during the COVID-19 pandemic using a nationally representative dataset. Our study shows there was a 0.8% higher prevalence of anxiety/depression among female participants, +1.7% among people aged ≥65, +5.1% among non-Hispanic Whites, and +25.2% among non-Hispanic Asians during the pandemic compared to before. Similarly, individuals with a BMI of 18.5–24.9 had a 7.4% higher prevalence of anxiety/depression symptoms and those with a BMI of <18.5 had a 44.5% higher prevalence of anxiety/depression symptoms during the pandemic compared with before.

We found a higher likelihood of mild and severe anxiety/depression symptoms during the pandemic relative to before the. This is consistent with a recent systematic review and meta-analysis[37] which found an increase in the prevalence of overall depression and anxiety among cancer patients during the pandemic. For instance, cancer patients experienced higher levels of anxiety (standard mean difference 0.25 [95% CI 0.08, 0.42]) during the

TABLE 2 Differences in anxiety/depression by sociodemographic characteristics and health behavior among cancer patients before and during the COVID-19 pandemic (Unweighted $n = 1434$)

	Before the COVID-19 pandemic Anxiety/Depression			During the COVID-19 pandemic Anxiety/Depression		
Characteristics	**Total (%) $n = 833$**	***n* (%) 223 (32.7)**	***P***	**Total (%) $n = 601$**	***n* (%) 177 (31.1)**	***P***
Age			<0.001			0.075
18–25	3 (4.1)	2 (95.2)		3 (1.6)	1 (16.1)	
26–34	9 (2.5)	4 (46.6)		9 (1.6)	4 (48.5)	
35–49	48 (9.9)	23 (62.3)		45 (16.3)	22 (49.7)	
50–64	225 (31.1)	69 (29.2)		165 (32.6)	54 (30.1)	
≥65	540 (52.4)	124 (23.8)		375 (47.9)	95 (25.5)	
Sex			0.275			0.015
Female	401 (56.1)	114 (35.4)		315 (56.4)	99 (36.2)	
Male	356 (43.9)	89 (28.9)		232 (43.6)	58 (23.0)	
Race/Ethnicity			0.003			0.300
Hispanic/Latino	53 (9.2)	28 (56.8)		52 (7.1)	17 (33.6)	
Non-Hispanic Asian	19 (2.5)	1 (1.9)		11 (1.5)	4 (27.1)	
Non-Hispanic Black/African American	65 (9.3)	19 (63.2)		51 (7.9)	16 (19.1)	
Non-Hispanic other	27 (2.6)	14 (60.4)		12 (1.0)	1 (3.3)	
Non-Hispanic White	582 (76.5)	134 (26.1)		410 (82.4)	115 (31.2)	
Sexual orientation			0.064			0.209
Lesbian/gay/bisexual	35 (4.0)	16 (54.6)		14 (2.1)	6 (49.9)	
Heterosexual	755 (96.0)	199 (32.7)		541 (97.9)	150 (29.5)	
Marital status			0.003			0.320
Divorced/separated	177 (13.7)	59 (41.1)		112 (10.6)	37 (40.4)	
Married/living as married	419 (56.9)	690 (22.7)		310 (63.6)	84 (30.8)	
Single/never married	80 (16.3)	26 (55.0)		70 (14.9)	22 (29.4)	
Widowed	152 (13.2)	46 (37.2)		92 (10.9)	25 (17.7)	
Level of education completed			<0.001			0.010
<High school	37 (9.3)	21 (81.9)		40 (5.8)	23 (66.7)	
High school graduate	152 (23.7)	48 (26.9)		125 (28.9)	43 (31.9)	
Some college	271 (39.9)	81 (33.4)		163 (36.8)	41 (28.9)	
≥College graduate	368 (27.2)	71 (19.1)		253 (28.6)	59 (22.2)	
Total annual family income			0.081			0.266
<$20,000	127 (14.7)	67 (54.3)		99 (19.5)	43 (39.5)	
$20,000–$34,999	116 (17.8)	38 (37.6)		76 (11.1)	21 (18.2)	
$35,000–$49,999	115 (20.4)	26 (38.8)		84 (16.1)	26 (39.3)	
$50,000–$74,999	139 (14.9)	34 (34.5)		92 (19.6)	24 (31.0)	
≥$75,000	234 (32.3)	42 (22.8)		179 (33.7)	39 (26.5)	
Health insurance			0.035			0.659
No	14 (3.1)	9 (67.4)		9 (5.2)	4 (39.1)	
Yes	807 (96.9)	212 (32.0)		580 (94.8)	171 (30.9)	

(Continues)

TABLE 2 (Continued)

Characteristics	Before the COVID-19 pandemic Anxiety/Depression			During the COVID-19 pandemic Anxiety/Depression		
	Total (%) $n = 833$	n (%) 223 (32.7)	P	Total (%) $n = 601$	n (%) 177 (31.1)	P
General health status			<0.001			0.001
Excellent/very good/good	626 (76.1)	125 (26.8)		449 (76.7)	106 (26.2)	
Fair/poor	187 (23.9)	90 (50.5)		149 (23.3)	70 (47.3)	
US census region			0.099			0.446
Midwest	157 (18.5)	46 (28.3)		95 (19.5)	29 (23.6)	
Northeast	103 (17.9)	32 (22.5)		85 (14.6)	19 (27.7)	
South	385 (43.4)	103 (39.6)		276 (38.5)	82 (32.1)	
West	188 (20.2)	42 (30.8)		145 (27.4)	47 (36.8)	
Body mass index (BMI)			0.621			0.068
18.5–24.9	249 (29.1)	55 (26.5)		167 (28.8)	43 (33.9)	
<18.5	10 (1.2)	4 (33.1)		14 (2.3)	7 (77.6)	
25.0–29.9	285 (38.2)	76 (33.8)		204 (33.6)	58 (26.2)	
≥30.0	266 (31.4)	76 (35.5)		205 (35.4)	66 (31.0)	
Moderate physical activity intensity			<0.001			0.229
None	278 (39.2)	105 (45.3)		182 (32.1)	69 (35.3)	
At least 1 day per week	540 (60.8)	116 (24.8)		410 (67.9)	103 (27.7)	
Cigarette smoking status			0.172			0.258
Current smoker	92 (12.8)	42 (47.4)		68 (12.9)	29 (39.8)	
Former smoker	319 (35.6)	83 (29.0)		199 (34.0)	54 (34.6)	
Never	417 (51.6)	96 (31.3)		324 (53.1)	90 (26.8)	

Note: 2019 and 2020 Health Information National Trends Surveys, HINTS 5 Cycles 3 and 4 respectively.Unweighted $N = 1434$; Weighted $N = 45{,}063{,}113$. Before the COVID-19 pandemic data (HINTS 5 Cycles 3) were collected January through April 2019, and during COVID-19 pandemic data were collected February through June 2020. Frequencies were not weighted, but percentages were weighted. Differences in total numbers may not add up in categories *e* due to missing data.

pandemic relative to non-cancer patients.[37] Additionally, in Momenimovahed et al's[38] systematic review that examined psychological distress, type of psychological problems, and effects of the pandemic on the life of cancer patients, they reported the pandemic significantly impacted the psychological health of cancer patients. This was due to several factors including fear of contracting COVID-19, disruption of oncology services, and fear of disease progression.[38]

We also found individuals experiencing fair/poor general health had significantly higher odds of anxiety/depression symptoms compared to people with excellent/very good/good general health. This may be due to reduced access to cancer care, cancer recurrence, immunosuppression risk, comorbidities, and advancement of cancer due to treatment delay; all of which are potential risk factors for depression and anxiety during the pandemic.[35,40] For example, Chen-See et al.[41] found 54% of cancer patients in a survey from the Canadian Cancer Survivor Network had their cancer treatment visits canceled, postponed, or rescheduled because of COVID-19. Yildirim et al.[42] also reported treatment delay due to COVID-19 was significantly associated with the increased risk of depression and anxiety among cancer patients. Furthermore, the threat of COVID-19 infection and cancer, immunosuppression risk, and having to delay regular clinical visits and therapies may all interact synergistically to produce greater fear, depression, and anxiety symptoms.

Consistent with the current findings, Parás-Bravo et al.[43] observed that among cancer patients, females were more likely to have reported experiencing anxiety/depression than males. Additionally, female individuals aged >65 years with cancer have been reported to be at higher risk of anxiety during the COVID-19 pandemic as compared to their male counterparts[44]; which is consistent with our finding that male cancer patients have a lower likelihood of anxiety/depression than female cancer patients during the pandemic. Similar to our findings, a cross-sectional study that included 63 countries found people <55 years old to be at a higher risk for developing depression and anxiety during the pandemic compared to those >55 years old.[45] The present study also showed cancer patients with a college education or higher had significantly lower odds of anxiety/depression than respondents with <high school education. Our results, however, are in contrast with the

TABLE 3 Odds of anxiety/depression symptoms among United States (US) adult cancer patients before and during the COVID-19 pandemic

	Before the COVID-19 pandemic (model I)		During the COVID-19 pandemic (model 2)	
	AOR	**95% CI**	**AOR**	**95% CI**
Age				
35–49	Ref	-	-	Ref
18–25	1.98	(0.15–26.35)	0.70	(0.06–8.02)
26–34	0.36	(0.04–3.29)	3.66	(0.57–23.65)
50–64	**0.29****	**(0.11–0.76)**	**0.33***	**(0.11–0.97)**
≥65	**0.13*****	**(0.05–0.34)**	**0.18*****	**(0.07–0.47)**
Sex				
Female	Ref	-	-	Ref
Male	1.14	(0.66–1.96)	0.59	(0.28–1.23)
Race/Ethnicity				
Hispanic/Latino	**2.70***	**(1.11–6.57)**	0.22	(0.05–1.01)
Non-Hispanic Black/African American	0.70	(0.19–2.58)	0.57	(0.16–2.06)
Non-Hispanic other	0.88	(0.24–3.19)	0.15	(0.01–2.10)
Non-Hispanic White	Ref	-	-	Ref
Sexual orientation				
Lesbian/gay/bisexual	1.95	(0.68–5.64)	2.19	(0.27–17.62)
Heterosexual	Ref	-	-	Ref
Marital status				
Divorced/separated	2.20	(0.66–7.27)	1.17	(0.38–3.63)
Married/living as married	0.80	(0.23–2.73)	0.91	(0.28–2.94)
Single/never married	Ref	-	Ref	-
Widowed	2.57	(0.78–8.46)	0.32	(0.08–1.29)
Level of education completed				
<High school	Ref	-	Ref	-
High school graduate	**0.08****	**(0.01–0.42)**	0.13	(0.01–1.21)
Some college	**0.10****	**(0.02–0.42)**	0.13	(0.01–1.22)
≥College graduate	**0.05*****	**(0.01–0.26)**	**0.06****	**(0.01–0.61)**
Total family annual income				
$50,000–$74,999	Ref	-	Ref	-
<$20,000	0.83	(0.27–2.50)	1.30	(0.23–7.16)
$20,000–$34,999	0.80	(0.26–2.44)	0.77	(0.23–2.63)
$35,000–$49,999	0.50	(0.17–1.80)	1.20	(0.32–4.46)
≥$75,000	0.71	(0.26–1.90)	1.52	(0.63–3.66)
Health insurance status				
Yes	Ref	-	Ref	-
No	1.07	(0.19–6.01)	0.27	(0.03–2.35)
General health status				
Excellent/very good/good	Ref	-	Ref	-
Fair/poor	1.85	(0.97–3.54)	**3.89****	**(1.39–10.87)**

(Continues)

TABLE 3 (Continued)

	Before the COVID-19 pandemic (model I)		During the COVID-19 pandemic (model 2)	
	AOR	95% CI	AOR	95% CI
US census region				
Midwest	**3.39****	**(1.35–8.48)**	0.85	(0.22–3.18)
Northeast	Ref	-	Ref	-
South	**3.75****	**(1.55–9.09)**	1.20	(0.32–4.44)
West	1.91	(0.59–6.19)	1.78	(0.45–6.94)
Body mass index (BMI)				
18.5–24.9	Ref	-	Ref	-
<18.5	1.22	(0.19–7.97)	2.99	(0.40–22.54)
25.0–29.9	1.57	(0.70–3.51)	0.60	(0.22–1.63)
≥30.0	1.18	(0.54–2.58)	**0.41***	**(0.18–0.96)**
Moderate physical activity intensity				
At least 1 day per week	Ref	-	Ref	-
None	1.76	(0.97–3.19)	1.00	(0.50–1.99)

Note: 2019 and 2020 Health Information National Trends Surveys, HINTS 5 Cycles 3 and 4 respectively. Before the COVID-19 pandemic data (HINTS 5 Cycles 3) were collected January through April 2019, and during COVID-19 pandemic data were collected February through June 2020. Non-Hispanic Asian were included in non-Hispanic other category due to limited cell count. The Bold Values indicated Statistical significance.

Abbreviations: AOR, Adjusted odds ratio; 95% CI, 95% confidence interval; Ref, Reference group.

* = $p \leq 0.05$, ** = $p \leq 0.01$, *** = $p \leq 0.001$.

COVID-19 and Life Stressors Impact on Mental Health and Well-Being Study conducted from March 31–13 April 2020, which reported no differences in the odds of depression across educational levels among the general US adult population.[46] This may be because cancer patients have unique risks and vulnerabilities compared to the general population.[37]

Although financial concerns and issues have been reported to be inversely linked with the quality of life in cancer patients during the pandemic,[47] our study found those earning >$75,000 had the greatest positive difference (+3.7%) in anxiety/depression prevalence during the pandemic compared to before the pandemic. We also found respondents with a BMI ≥30.0 had significantly lower odds of anxiety/depression relative to patients with a BMI of 18.5–24.9. Our finding is inconsistent with another study that reported breast cancer and prostate cancer patients with BMIs ≥30 had worse psychosocial well-being than individuals with BMIs <30 during the pandemic.[48] Similar to other studies,[49,50] we found that being married/living with a partner had a lower risk of anxiety/depression relative to those who are single. This is most likely due to married individuals often having greater social support than those who are unmarried.[49,50]

4.1 | Limitations

First and foremost, HINTS is a cross-sectional survey, and therefore, we were unable to establish any causal relationship between the COVID-19 pandemic and anxiety/depression. Also, pre-pandemic data can only be a proxy for baseline levels of anxiety/depression due to the cross-sectional data used. Thus, caution should be taken when interpreting the findings. Additionally, small samples within some of the categories could affect the estimation of anxiety/depression among the population (e.g., respondents aged 18–25 and 26–34 years old). Moreover, we did not assess COVID-19 outcomes among the population because the HINTS did not include such questions or measures. Also, HINTS does not provide data on active treatment status. We recommend future HINTS surveys collect this data to enable future studies to examine differences in cancer treatment status as research has found patients undergoing treatment have worse quality of life and poorer mental health symptoms than patients not in active treatment.[51,52] Furthermore, the data is self-reported and may result in recall and social desirability biases. Finally, differences in anxiety/depression between the two survey years may be attributed to differences in demographics between the two survey years.

4.2 | Clinical implications

The findings of this study show more effort and resources need to be allocated to providing mental health services to cancer patients, especially as we continue to navigate the COVID-19 pandemic. Cancer patients may be a uniquely impacted population during the pandemic given the potential disruptions in cancer therapy that can increase disease anxiety and worsen mental health symptoms. Additionally, our results suggest Hispanic/Latino cancer patients may be more likely to report anxiety/depression symptoms, meaning clinicians should be well-versed in culturally humble methods of care and actively screen

cancer patients for anxiety/depression symptoms. Finally, previous studies have highlighted the utility of self-reported health status in predicting mortality, life expectancy, hospitalizations, and health behaviors at both the individual level and community health level among a variety of populations, including cancer patients.[53–55] We are the first to illustrate that cancer patients reporting fair/poor health have significantly higher odds for anxiety/depression symptoms during the pandemic. This finding emphasizes the potential of using self-reported health status as a clinical screening tool to assess patients for possible risk for mental health symptoms.

5 | CONCLUSIONS

In this nationally representative sample of US adult cancer patients, our findings show anxiety/depression symptoms vary across the population before and during the pandemic. The prevalence of anxiety/depression symptoms was higher among females before and during the pandemic. Also, the prevalence of anxiety/depression was higher among patients aged 26–34 and ≥65 years, non-Hispanic Whites, and non-Hispanic Asians. The likelihood of experiencing anxiety/depression symptoms during the pandemic was higher among cancer patients aged 35–49 years, those with fair/poor health status, and those with less than high school education. Our findings establish the need to provide urgent mental health services to high-risk groups among the cancer patient population and to alleviate any related burdens or risks from anxiety/depression.

ACKNOWLEDGEMENTS

Cameron K. Ormiston and Faustine Williams efforts were supported by the Division of Intramural Research, National Institute on Minority Health and Health Disparities, National Institutes of Health (ZIA MD000015). The content is solely the responsibility of the authors and does not necessarily reflect the views of the National Institutes of Health.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data are publicly available on the National Cancer Institute website (https://hints.cancer.gov).

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How to cite this article: Adzrago D, Sulley S, Tagoe I, et al. Assessment of anxiety/depression among cancer patients before and during the COVID-19 pandemic. *Psychooncology*. 2022;31(10):1681-1691. https://doi.org/10.1002/pon.6026