Clinical Medicine & Research
Volume 22, Number 2: 61-75

clinmedres.org

Original Research

COVID-19-Related Treatment Cancellations and Oncology Patients' Psychological Health in Nigeria

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Objective: To explore the association between COVID-19-related cancer treatment cancellations and the psychological health of cancer patients in Nigeria.

Methods: We analyzed data collected from 15 outpatient cancer clinics, comprising 1,097 patients between April to July 2020. Study outcome was ten psychological impacts, including feeling down, stressed, and unable to access treatment due to COVID-19 (used as continuous and categorical variable (0-3,4-7,8+ events). The independent variable was treatment cancellations due to COVID-19 categorized as 0, 1, and 2+ cancellations. Confounders included religion, ethnicity, income, cancer diagnosis/type, and treatment received. Stata/SE.v.17 was used to perform all analyses. *P* values of ≤0.05 were deemed statistically significant.

Results: Of the 1,097 cancer patients, 65.7% were female, with a mean age (SD) of 49.4 (13.8) years. Most patients (50.3%) reported four to seven psychological health events. Cancer patients who reported two/more treatment cancellations made up only 12.8% of the study sample but accounted for a greater proportion of psychological impacts (23.5%; *P*<0.001). In the adjusted model, cancer patients with one treatment cancellation (Coef: 0.195, 95%CI: 0.089–0.302) and those with two/more cancellations (Coef: 0.379, 95%CI: 0.255–0.504) had a significantly higher risk of psychological health impacts than those with no treatment cancellations.

Conclusion: More than half of our sample of primarily adult female cancer patients reported major psychological health effects due to COVID-19. Cancer patients who experienced at least one treatment cancellation had a higher risk of psychological health consequences than those who did not. The implications of our findings and how to mitigate the impact of COVID-19 on oncology service disruptions are discussed.

Keywords: Cancer treatment; COVID-19; Psychological health; Nigeria

On December 31, 2019, cases of pneumonia of unclear cause were recorded in Wuhan, China.[1] The causative agent was identified to be the novel coronavirus SARS-CoV-2 (coronavirus disease 2019—COVID-19).[2] Transmission rates of the virus increased rapidly, and due to its continued spread and increasing severity and fatality, COVID-19 was declared a pandemic on March 11, 2020.[1,2] COVID-19 has variable clinical presentations, ranging from mild symptoms to severe respiratory symptoms and multiple organ failure.[3] Certain demographics are predisposed to severe COVID-19 infection such as the elderly, immunosuppressed individuals, and people with comorbidities

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Disclosures: The authors have no funding related to this work and no potential conflicts of interest to disclose. The data that support the findings of this study are available from the corresponding author upon request.

Received: May 23, 2023
Revised: May 28, 2024
Accepted: June 3, 2024

doi:10.3121/cmr.2024.1854

such as diabetes, hypertension, cardiovascular conditions, and cancer.[4]

Currently, there is no specific treatment for COVID-19 used globally; instead, various treatment strategies that differ by country are utilized.[4] Prevention, especially with the rollout of vaccines, remains the most effective method of combating the pandemic. Other prevention techniques include hand washing, physical distancing, use of personal protective equipment, self-isolation, and quarantine.[4,5] The effects of isolation and quarantine cut across several aspects of our lives, with economic, financial, and most of all psychological consequences.[6] From the possibility of contracting this novel virus, heightening the general public's anxiety, to forced isolation, and possible stigmatization of infected individuals, COVID-19's effect on psychological health cannot be overemphasized.[6,7] Previous studies have shown these peculiar situations can produce psychosocial effects such as fear, anxiety, insomnia, depression, and in severe cases, suicidal ideations.[7]

The pandemic strained healthcare delivery and services worldwide, affecting patients with various forms of illnesses.[2] Doctor-patient consultations moved to telemedicine platforms, and non-emergency cases were delayed to make space for COVID-19 cases. Because of these changes and the various lockdown orders countries implemented, the treatment of cancer patients in particular had been radically altered, delaying treatments such as elective surgeries, intravenous chemotherapy, and radiotherapy regimens. Patients undergoing cancer diagnosis and treatment already feel immense emotional and psychological strain.[8] Adding the unprecedented pandemic and its modifications to social interaction further adversely affected the psychological health of cancer patients.[7,9] Restricted human interactions also limits social support received from family and friends during the course of treatment.[10–12]

Cancer is a non-communicable disease with a rapidly increasing incidence rate in Nigeria.[13] Nigeria, a west African country bordered by Niger, Cameroon, Chad, and Benin, is Africa's most populated country with over 200 million inhabitants, and it is one of the ten most populous countries in the world.[14,15] In Nigeria, a nation divided into six geopolitical zones, comprising 36 states, approximately 120,000 new cancer cases are diagnosed each year, resulting in over 70,000 deaths attributable to the disease annually.[13,14] The majority of cancer patients are usually in an immunosuppressed condition caused either by the malignancy itself or cancer treatments.[10] The immunosuppressed condition of cancer patients puts them at significant risk for infections, including COVID-19, which can further complicate their condition.[10] It has been documented that cancer patients are more likely to have severe forms of COVID-19 complications compared to those without cancer.[16] Furthermore, the impact of the COVID-19 pandemic disrupted oncology services for patients and impaired their psychological health by increasing anxiety and depression.[17] While most cancer patients experienced at least one stressor (anxiety, depression, or insomnia) during the COVID-19 pandemic,[18] COVID-19-related treatment cancellations and their impact on cancer patients' psychological health in low and middle-income countries (LMICs), such as Nigeria, received little attention. While COVID-19's harmful impact on the psychological health of the general public, as well as cancer patients, has been demonstrated,[7,19,20] no research has been conducted on the pandemic's effect on cancer patients in Sub-Saharan Africa. To address this knowledge gap, this study examined the psychological impact of COVID-19 on cancer patients, specifically the association between COVID-19-related treatment cancellations and the psychological health of oncology patients in Nigeria.

Methods

Study design

This is a cross-sectional study employing a quantitative data collection technique to investigate the psychological health impacts of COVID-19 on cancer patients in Nigeria. We analyzed data from the "Cancer Treatment During the COVID-19 Pandemic: Patients' Perception of Care Data Collection Tool," which comprised 1,097 cancer patients between April and July 2020. This tool was created in response to the unique circumstances presented by the COVID-19 pandemic and the need to rapidly assess its impact on oncology patients in Nigeria. Due to the urgency of the pandemic and the lack of existing validated tools tailored to our specific research objectives, we designed this survey after consulting with clinical experts and reviewing relevant literature to ensure comprehensive coverage of the pertinent aspects of psychological health during such crises. Although we were unable to conduct preliminary pilot testing of the tool owing to time constraints, we adapted questions from established psychological impact measures to fit the specific context of COVID-19 and disruptions in oncology care. The psychological health events assessed by our study were derived from commonly reported psychological responses in existing literature, focusing on heightened anxiety and stress due to treatment disruptions.[21,22] These considerations highlighted the need for interpreting our findings within the context of these methodological constraints and underscored the importance of developing validated instruments for future research in similar settings. The survey was conducted in 15 outpatient cancer clinics, which together provide care for approximately 70% of all cancer patients in Nigeria. The research was performed across various Nigerian geopolitical zones, encompassing both government-funded and private facilities. These included centers such as the Cancer Center at Lagos University Teaching Hospital (NSIA-LUTH) in Lagos State; Lagos State University Teaching Hospital (LASUTH) in Lagos State; University College Hospital (UCH) in Oyo State; Federal Medical Centre (FMC) in Abeokuta, Ogun State; University of Benin Teaching Hospital (UBTH) in Edo State; University of Nigeria Teaching Hospital (UNTH) in Enugu State; Alex

Ekwueme Federal Teaching Hospital in Abakaliki, Ebonyi State; University of Port Harcourt Teaching Hospital (UPTH) in Rivers State; National Hospital (NH) in Abuja, Federal Capital Territory; Federal Medical Center in Makurdi, Benue State; Federal Teaching Hospital (FTH) in Gombe, Gombe State; Usman Danfodio University Teaching Hospital (UDUTH) in Sokoto, Sokoto State; and Ahmadu Bello University Teaching Hospital (ABUTH) in Kaduna, Kaduna State. The private centers included Eko Hospital and Lakeshore Cancer Center, both located in Lagos State.

In terms of the sampling method, at least one center was selected from each of the geopolitical zones using a stratified sampling methodology. Individual centers in these zones were selected based on the availability of cancer treatment centers in those regions. Patients were recruited for the study in respective centers using consecutive sampling methodology. Data were collected using a pre-defined study questionnaire self-administered to the participants of the study over 6 consecutive weeks from April to July 2020. The study questionnaire was based on the study objectives and contained relevant information about the patient including sociodemographic information, clinical history, medical history, understanding of the pandemic, and the pandemic's psychosocial impact on the patient. The section on psychosocial impact had questions further exploring the effect of control guidelines on their treatment. The questions were in English and simplified to aid understanding. All participants included in the study were required to be literate in English, as confirmed through preliminary assessments by healthcare providers during the recruitment phase using brief verbal interactions and informed consent procedures, all conducted in English. The questionnaire was designed with simplified language and structured clearly, reviewed by a team of healthcare professionals to ensure accessibility for individuals with general English literacy, and assistance was provided during administration to clarify any questions, thereby enhancing the reliability of the data collected. The administration of questionnaires was done only on clinic days at the hospital, and care was taken to ensure social distancing. Patients who were seen at one of the participating centers during the study period (April-July 2020) were included in the study. Adults 18 years-of-age or older who were literate in English, answered the psychological health questions, and had a histologically proven cancer diagnosis were also eligible. All patients who did not visit the clinics throughout the study period, children (those under the age of 18), and patients who had never been diagnosed with cancer were excluded from this analysis. Ethical approval for this study was secured from the institutional review boards of all participating centers, ensuring compliance with both local and international ethical standards for research involving human subjects. The National Health Research and Ethics Committee of Nigeria granted Institutional Review Board approval for the study *(NHREC Protocol Number NHREC/01/01/2007-10/09/2020; NHREC Approval Number NHREC/01/01/2007-18/09/2020)*. The data collection process, study design, and ethics approval were all thoroughly described in our recent articles.[23,24]

Study measures

The study outcomes (dependent variable) were the ten psychological health impacts of COVID-19. These included feeling down, uncertain and/or stressed because of COVID-19; worrying they would be unable to access treatment; feeling worried COVID-19 will reduce quality of treatment; worrying COVID-19 will delay treatment and reduce its effectiveness; feeling bothered about visiting limitation and being unable to be with family; feeling discrimination from doctors/nurses due to social distancing in the hospital; feeling discrimination from the public because cancer makes you at risk of COVID-19; thoughts that COVID-19 will affect the ability to pay for treatment, worry that COVID-19 will affect your ability to finance your care, and accessibility to resources for stress and anxiety management. These variables were categorized as 0-3, 4-7, 8+ events and used as a continuous variable. This stratification was intended to reflect varying levels of impact on patients' psychological health, allowing us to treat these categories as a continuous scale in statistical analyses. This method enabled us to discern subtle differences and trends in psychological health outcomes correlating with the intensity of COVID-19-related disruptions experienced by patients.

The independent variable (exposure) included cancer treatment cancellations due to COVID-19, such as cancelled/postponed surgery, radiotherapy, chemotherapy, injection chemotherapy, and seen less by doctor/nurse (all recorded as no/yes) and categorized as 0, 1, and 2 or more cancellations.

Confounders included sociodemographic information and medical history. *Sociodemographic cofounders* were recorded as patient's sex (categorized as male and female), age (18-34 years, 35-44 years, 45-54 years, and 55 years & over), religion (Christianity and Islam), ethnicity (Hausa, Igbo, Yoruba, and Other), marital status (married, single, and divorced/separated/widowed), education level (categorized as none, primary, secondary, and tertiary), and monthly income level (categorized as <N40,000 [<$100], N40,000≤N200,000 [$100≤$480], N200,000 and above [≥$480] in Naira and US dollars using April 24, 2022, exchange rate). Religion and ethnicity were included as confounding variables due to their potential influence on both treatment disruption and psychological responses. These factors are integral in understanding differential access to healthcare and varied psychosocial responses within diverse sociocultural contexts.[25,26] Such considerations help elucidate the complex interplay of sociocultural dynamics in health disparities observed among Nigerian cancer patients during the COVID-19 pandemic. The categorization of monthly income levels with N40,000 as the lower threshold aligns with the national minimum wage[27] and provided a relevant economic context to explore disparities in

Table 1. Patient characteristics (N=1,079) (continued on page 65)

Study Measures/Variables	n	%
Sociodemographic information		
Sex: female	709	65.71
Male	370	34.29
Age groups: 18-34 years	152	14.09
35-44 years	238	22.06
45-54 years	311	28.82
55 years & over	378	35.03
Age, mean (SD), range	49.38 (13.81), 18-88	
Religion: Christianity	838	77.66
Islam	241	22.34
Ethnicity: Hausa	122	11.31
Igbo	442	40.96
Yoruba	338	31.33
Other	177	16.40
Marital status: married	847	78.50
Single	131	12.14
Divorced/separated/widowed	101	9.36
Education level: no formal education	73	6.77
Primary	112	10.38
Secondary	457	42.35
Tertiary	437	40.50
Monthly income in Naira (US$ April 24, 2022, exchange rate): <N40,000 (<$100)	392	36.33
N40,000-<N200,000 ($100-<$480)	630	58.39
N200,000 and above (≥$480)	57	5.28
Psychosocial impact of COVID-19		
Feeling down, uncertain and/or stressed because of COVID-19: no	541	50.14
Yes	538	49.86
Worried being unable to access treatment: no	509	47.17
Yes	570	52.83
Worried COVID-19 will reduce quality of treatment: no	526	48.75
Yes	553	51.25
Worried COVID-19 will delay treatment and reduce effectiveness: no	519	48.10
Yes	560	51.90
Bothered about visiting limitation and being unable to be with family: no	628	58.20
Yes	451	41.80
Felt discriminated by doctors/nurses due to social distancing in hospital: no	860	79.70
Yes	219	20.30
Felt discriminated by public because cancer makes you at risk of COVID-19: no	719	66.64
Yes	360	33.36
Thought COVID-19 will affect ability to pay for treatment: no	372	34.48
Yes	707	65.52
COVID-19 affected ability to finance your care: no	625	57.92
Yes	454	42.08
Have access to resources for stress and anxiety management: no	892	82.67
Yes	187	17.33
Number of psychological impacts		
0	8	0.74
1	126	11.68
2	86	7.97
3	137	12.70

Table 1. Patient characteristics (N=1,079) (continued from page 64)

Study Measures/Variables	n	%
4	107	9.92
5	141	13.07
6	147	13.62
7	148	13.72
8	93	8.62
9	60	5.56
10	26	2.41
Psychological impacts categories		
0-3	357	33.09
4-7	543	50.32
8+	179	16.59
COVID-19 impact on cancer care		
Cancelled/postponed surgery: no	984	91.20
Yes	95	8.80
Cancelled/postponed radiotherapy: no	1006	93.23
Yes	73	6.77
Cancelled/postponed chemotherapy: no	968	89.71
Yes	111	10.29
Cancelled/postponed injection chemotherapy: no	969	89.81
Yes	110	10.19
Seen less by doctor/nurse: no	890	82.48
Yes	189	17.52
COVID-19 impact on cancer care: Canceled Treatments categories		
0 Cancellation	737	68.30
1 Cancellation	204	18.91
2+ Cancellations	138	12.79
Medical history		
Cancer diagnosis/type: breast cancer	402	37.26
Head & neck cancers	43	3.99
Gynecologic (GYN) cancer (cervical, endometrial, ovarian)	210	19.46
Male GUS (bladder, prostate, testicular)	134	12.42
Others (central nervous system, sarcomas (soft tissue & bone), skin, lymphomas)	290	26.88
Cancer treatment received: surgery: no**	599	55.88
Yes	473	44.12
Radiotherapy: no	750	69.51
Yes	329	30.49
Chemotherapy: no	366	33.92
Yes	713	66.08
Chemo radiation: no	1011	93.70
Yes	68	6.30
Comorbidities: hypertension: no	842	78.04
Yes	237	21.96
Diabetes: no	1005	93.14
Yes	74	6.86
Asthma/COPD: no	1046	96.94
Yes	33	3.06
Comorbid conditions		
0 condition	783	72.57
1 condition	250	23.17
2+ conditions	46	4.26

** Would not add up to the overall sample due to missing observations

health outcomes among different income groups in Nigeria. Patient *medical history* was recorded as cancer diagnosis/type categorized as breast cancer, head and neck cancers, gynecologic (GYN) cancer (cervical, endometrial, ovarian), male Monoclonal Gammopathy of Unknown Significance/GUS (bladder, prostate, testicular), and others (central nervous system, sarcomas (soft tissue and bone), skin, lymphomas etc.), cancer treatment received (surgery, chemotherapy, radiotherapy, and chemoradiation, all coded as no/yes), and comorbid conditions (hypertension, diabetes, and asthma /chronic obstructive pulmonary disease, all coded as no/yes and categorized as 0, 1 and 2 or more conditions).

Statistical analysis

For our data analysis, we used a three-step procedure. First, we performed descriptive statistics on all study measures, such as counts/frequency, and percentages. Then, a bivariate analysis was performed (using chi-square tests on all study variables per study outcome (number of psychological health impacts of COVID-19). Finally, a multivariate linear regression analysis was used to examine the relationship between the independent variable (cancelled cancer treatment) and study outcome, while controlling for confounders such as sociodemographic information and medical history. The assumptions necessary for multivariate linear regression, such as linearity, independence, and equal variance, were satisfied, and our adjusted R^2 value of 0.0537 demonstrates the model's effectiveness in explaining approximately 5.37% of the variance observed in psychological health impacts among the patients studied. We presented percentages, *P* values, and coefficients and 95% Confidence Intervals (CIs). All statistical analyses were performed using Stata/SE. version.17,[28] and *P* values of ≤0.05 were considered statistically significant.

Results

Our findings regarding the characteristics of cancer patients were as follows. A large percentage of the 1,097 cancer patients (65.7%) in our sample were female compared to male (34.3%), with an average age (SD) of 49.4 (13.8) years. More cancer patients reported four to seven psychological health events (50.3%), followed by zero to three (33.1%), and eight or more events (16.6%). The majority of patients (68.3%) reported no cancer treatment cancellations as a result of COVID-19, compared to those who reported one cancellation (18.9%) and two or more cancellations (12.8%). More than half of patients (58.4%) earned an income between 40,000 to 200,000 Naira ($100-$480) per month, compared to those who earned less than 40,000 Naira/less than $100 (36.3%) and those who earned 200,000 Naira/$480 and above (5.3%). In terms of cancer treatment, more patients in our sample received chemotherapy (66.1%), followed by surgery (44.1%), radiotherapy (30.5%), and chemo radiation (6.3%), compared to patients who did not report receiving these cancer treatments. Table 1 contains descriptive statistics on patient characteristics including patients' sociodemographic information, COVID-19 impact on cancer care, and medical history.

Our study also yielded information regarding factors that were associated with COVID-19-related psychological health experiences for oncology patients. Table 2 (bivariate analysis) demonstrates the sociodemographic and medical history factors associated with COVID-19-related psychological health occurrences in Nigerian cancer patients. The number of treatment cancellations due to COVID-19 had statistically significant association with psychological health impacts. While more than half of patients (50.3%) reported four to seven psychological health impacts due to COVID-19, patients who reported two or more treatment cancellations made up only 12.8% of the study sample, but accounted for a greater proportion of psychological impacts (23.5%) as a result of COVID-19 ($P<0.001$). Monthly income had a statistically significant association with COVID-19-related psychological health experiences among oncology patients ($P<0.04$). More than half of cancer patients (68.7%) who earned between 40,000 to 200,000 Naira per month reported the most psychological health impacts (eight or more events). Cancer treatments received also had a statistically significant association with COVID-19-related psychological health among oncology patients ($P=0.01$), with more than two-thirds of cancer patients (70.9%) who received chemotherapy reporting zero to three psychological health impacts, compared to those who did not receive chemotherapy. The distribution of psychological impacts among patients who did not receive surgery was 30.88% for zero to three impacts, 50.75% for four to seven impacts, and 18.36% for eight or more impacts, showing no statistically significant variation ($P=0.99$). In contrast, chemoradiation treatment demonstrated a significant association, where those not receiving chemoradiation reported lower psychological impacts (33.93% for zero to three events, 49.36% for four to seven events, 16.72% for eight or more events) compared to those who did receive chemoradiation, highlighting a significant disparity ($P=0.04$). Our data also show that the impact of COVID-19 necessitated treatment cancellations, which in turn impacted the psychological health of oncology patients. In the adjusted model (Table 3), cancer patients with one treatment cancellation (Coef: 0.195, 95% CI: 0.089 – 0.302) and those with two or more cancellations (Coef: 0.379, 95% CI: 0.255 – 0.504) had a significantly higher risk of psychological health impacts than those with no treatment cancellations. Other factors in the adjusted analysis were significantly associated with the psychological health effects of COVID-19. For example, cancer patients with a monthly income between N40,000 - ≤N200,000 ($100 - ≤$480) had a higher likelihood of reporting psychological health impacts due to COVID-19 (Coef: 0.131, 95% CI: 0.044– 0.218) compared to those who earned less than N40,000 (<$100). Patients who received chemotherapy, on the other hand, were less likely than those who did not receive chemotherapy to report psychological health effects caused by COVID-19 (Coef: -0.083, 95% CI: -0.17 – 0.005).

Table 2. Factors associated with COVID-19-related Psychological Health Impacts in Cancer Patients (continued on page 68)

Study Measures/Variables	Number of Psychological Impacts				
	0-3	4-7	8+	Total	*P* value
	n=357	n=543	n=179		
	33.09%	50.32%	16.59%		
Age Groups					
18-34 years	47	81	24	152	0.809
	30.92	53.29	15.79	100.00	
	13.17	14.92	13.41	14.09	
35-44 years	85	110	43	238	
	35.71	46.22	18.07	100.00	
	23.81	20.26	24.02	22.06	
45-54 years	97	164	50	311	
	31.19	52.73	16.08	100.00	
	27.17	30.20	27.93	28.82	
55 years & over	128	188	62	378	
	33.86	49.74	16.40	100.00	
	35.85	34.62	34.64	35.03	
Sex					
Female	247	345	117	709	0.216
	34.84	48.66	16.50	100.00	
	69.19	63.54	65.36	65.71	
Male	110	198	62	370	
	29.73	53.51	16.76	100.00	
	30.81	36.46	34.64	34.29	
Patient's Religion					
Christianity	293	411	134	838	0.049*
	34.96	49.05	15.99	100.00	
	82.07	75.69	74.86	77.66	
Islam	64	132	45	241	
	26.56	54.77	18.67	100.00	
	17.93	24.31	25.14	22.34	
Ethnicity					
Hausa	33	60	29	122	0.015*
	27.05	49.18	23.77	100.00	
	9.24	11.05	16.20	11.31	
Igbo	168	208	66	442	
	38.01	47.06	14.93	100.00	
	47.06	38.31	36.87	40.96	
Yoruba	108	182	48	338	
	31.95	53.85	14.20	100.00	
	30.25	33.52	26.82	31.33	
Other	48	93	36	177	
	27.12	52.54	20.34	100.00	
	13.45	17.13	20.11	16.40	
Marital Status					
Married	270	437	140	847	0.492
	31.88	51.59	16.53	100.00	
	75.63	80.48	78.21	78.50	
Single	47	62	22	131	
	35.88	47.33	16.79	100.00	
	13.17	11.42	12.29	12.14	

Table 2. Factors associated with COVID-19-related Psychological Health Impacts in Cancer Patients (continued on page 69)

Study Measures/Variables	Number of Psychological Impacts				
	0-3	4-7	8+	Total	*P* value
	n=357	n=543	n=179		
	33.09%	50.32%	16.59%		
Divorced/Separated/Widowed	40	44	17	101	
	39.60	43.56	16.83	100.00	
	11.20	8.10	9.50	9.36	
Education level					
No Formal Education	23	35	15	73	0.658
	31.51	47.95	20.55	100.00	
	6.44	6.45	8.38	6.77	
Primary	40	59	13	112	
	35.71	52.68	11.61	100.00	
	11.20	10.87	7.26	10.38	
Secondary	143	237	77	457	
	31.29	51.86	16.85	100.00	
	40.06	43.65	43.02	42.35	
Tertiary	151	212	74	437	
	34.55	48.51	16.93	100.00	
	42.30	39.04	41.34	40.50	
Monthly Income level in Naira (US $ April 24, 2022, Exchange Rate)					
<N40,000 (<$100)	134	207	51	392	0.038*
	34.18	52.81	13.01	100.00	
	37.54	38.12	28.49	36.33	
N40,000-<N200,000 ($100-<$480)	203	304	123	630	
	32.22	48.25	19.52	100.00	
	56.86	55.99	68.72	58.39	
N200,000 and above (≥$480)	20	32	5	57	
	35.09	56.14	8.77	100.00	
	5.60	5.89	2.79	5.28	
Cancer diagnosis/ type					
Breast cancer	163	169	70	402	0.003*
	40.55	42.04	17.41	100.00	
	45.66	31.12	39.11	37.26	
Head & Neck Cancers	9	27	7	43	
	20.93	62.79	16.28	100.00	
	2.52	4.97	3.91	3.99	
Gynecologic (GYN) Cancer (Cervical, endometrial, ovarian)	59	117	34	210	
	28.10	55.71	16.19	100.00	
	16.53	21.55	18.99	19.46	
Male GUS (bladder, prostate, testicular)	45	67	22	134	
	33.58	50.00	16.42	100.00	
	12.61	12.34	12.29	12.42	
Others (central nervous system, sarcomas (soft tissue and bone), skin, lymphomas etc.)	81	163	46	290	
	27.93	56.21	15.86	100.00	
	22.69	30.02	25.70	26.88	
Surgery Treatment Received					
no	185	304	110	599	0.999
	30.88	50.75	18.36	100.00	
	52.11	56.40	61.80	55.88	

Table 2. Factors associated with COVID-19-related Psychological Health Impacts in Cancer Patients (continued from page 68)

Study Measures/Variables	Number of Psychological Impacts				
	0-3	4-7	8+	Total	*P* value
	n=357	n=543	n=179		
	33.09%	50.32%	16.59%		
Surgery Treatment Received					
yes	170	235	68	473	
	35.94	49.68	14.38	100.00	
	47.89	43.60	38.20	44.12	
Chemotherapy Treatment Received					
no	104	186	76	366	0.009*
	28.42	50.82	20.77	100.00	
	29.13	34.25	42.46	33.92	
yes	253	357	103	713	
	35.48	50.07	14.45	100.00	
	70.87	65.75	57.54	66.08	
Chemoradiation Treatment Received					
no	343	499	169	1011	0.038*
	33.93	49.36	16.72	100.00	
	96.08	91.90	94.41	93.70	
yes	14	44	10	68	
	20.59	64.71	14.71	100.00	
	3.92	8.10	5.59	6.30	
COVID-19 impact on cancer care					
0 Cancellation	288	344	105	737	<0.001*
	39.08	46.68	14.25	100.00	
	80.67	63.35	58.66	68.30	
1 Cancellation	46	126	32	204	
	22.55	61.76	15.69	100.00	
	12.89	23.20	17.88	18.91	
2+ Cancellations	23	73	42	138	
	16.67	52.90	30.43	100.00	
	6.44	13.44	23.46	12.79	
Number of Comorbid Conditions					
0 condition	268	393	122	783	0.358
	34.23	50.19	15.58	100.00	
	75.07	72.38	68.16	72.57	
1 condition	77	123	50	250	
	30.80	49.20	20.00	100.00	
	21.57	22.65	27.93	23.17	
2+ conditions	12	27	7	46	
	26.09	58.70	15.22	100.00	
	3.36	4.97	3.91	4.26	

First row has *frequencies*; second row has *row percentages*, and third row has *column percentages*

*Statistically significant at $P \leq 0.05$

Discussion

We examined the relationship between COVID-19-related cancer treatment cancellations and their impact on oncology patients' psychological health by analyzing data from 15 outpatient cancer clinics that care for approximately 70% of all cancer patients in Nigeria. After controlling for patient religion, ethnicity, monthly income level, cancer diagnosis/type, and type of cancer treatment received, we discovered more than half of a sample of primarily adult female cancer patients reported significant psychological health effects due to COVID-19, and cancer patients who had at least one treatment cancellation had a significantly higher risk of psychological health effects than those who had no treatment cancellations. Our analysis indicates a significant association between the number of treatment

Table 3. Impact of COVID-19 necessitated treatment cancellations on the psychological health (outcome) of oncology patients

Study Measures	Coef.	95% CI		Sig
COVID-19 impact on cancer care				
0 Treatment Cancellation	Ref.			
1 Treatment Cancellation	.195	.089	.302	***
2+ Treatment Cancellations	.379	.255	.504	***
Patient's Religion				
Christianity	Ref.			
Islam	.059	-.068	.185	
Ethnicity				
Hausa	Ref.			
Igbo	-.086	-.26	.088	
Yoruba	-.097	-.255	.06	
Other	.052	-.127	.231	
Monthly Income level in Naira (US$ April 24, 2022, Exchange Rate)				
<N40,000 (<$100)	Ref.			
N40,000-<N200,000 ($100-<$480)	.131	.044	.218	***
N200,000 and above (≥$480)	.002	-.187	.19	
Cancer diagnosis/ type				
Breast cancer	Ref.			
Head & Neck Cancers	.125	-.087	.337	
Gynecologic (GYN) Cancer (Cervical, endometrial, ovarian)	.064	-.05	.177	
Male GUS (bladder, prostate, testicular)	.028	-.106	.161	
Others (central nervous system, sarcomas (soft tissue and bone), skin, lymphomas etc.)	.063	-.041	.167	
Chemotherapy Treatment Received				
no	Ref.			
yes	-.083	-.17	.005	*
Chemoradiation Treatment Received				
no	Ref.			
yes	.124	-.044	.293	

**** P<.01, ** P<.05, * P<.1*

cancellations and increased psychological impacts. Specifically, patients who experienced two or more treatment cancellations, representing a subgroup with a higher prevalence of comorbid conditions, faced not only the immediate impacts of COVID-19 on their cancer care, but also the exacerbated stress from managing multiple health challenges ($P < 0.001$). These findings corroborate the literature suggesting that multimorbidity significantly affects health outcomes and underscores the importance of integrating multimorbidity considerations into the management of cancer patients, especially during disruptive events like pandemics.[29,30] This complexity is critical for developing comprehensive management strategies that address both the physical and psychological needs of multimorbid patients, ensuring healthcare systems are equipped to handle the challenges these patients face during health crises.

Cancer patients who experienced at least one treatment cancellation due to COVID-19 had a significantly higher risk of experiencing psychological health impacts compared to those who had no treatment cancellations. This distinction is crucial for understanding the specific psychosocial needs of cancer patients during pandemics and emphasizes the importance of maintaining continuous cancer care to mitigate

additional psychological stress. One possible explanation for this finding is that disruptions in oncology care induced by COVID-19 and patients' concerns about their immunocompromised status in the context of progressing cancer and COVID-19 may cause patients to be worried, resulting in significant psychological health consequences. A systematic review study discovered COVID-19 has a significant impact on the psychological health of cancer patients, and the most common factors associated with psychological distress in oncology patients were fear of COVID-19, cancer stage, fear of disease progression, and immunocompromised status.[31] Another study carried out in Poland explored the impact of COVID-19 on anxiety levels of cancer patients, showing their level of fear and anxiety regarding cancer surpassed anxiety relating to coronavirus.[32] It was shown that anxiety levels regarding coronavirus is higher when the number of COVID cases and deaths peaked.[32] It was also discovered that anxiety levels were higher among women and patients with breast cancer, though there were no significant associations with patients' age.[32] Regarding COVID-19 pandemic, the major concern of this study's participants was the effect of treatment delay and changes in treatment routines on their overall treatment plan.[32] Furthermore, an analysis of cancer support line calls and forum discussions in Australia revealed 33% of respondents reported feeling isolated as a result of the need to quarantine and maintain social distance, resulting in fear, psychological distress, and significant anxiety about their susceptibility to COVID-19.[33] Approximately 26% of participants reported delays to their care and treatment process, which included both institutional and self-cancellation; these disruptions included cancellations of chemotherapy, doctor's appointments, essential investigations, and surgical procedures.[33] The preceding studies support our main finding that treatment cancellation was associated with a significantly higher risk of psychological health effects than those who did not have treatment cancellations, and the studies provide insight into how COVID-19 affected cancer patients' psychological health and the common factors linked to psychological distress in oncology patients. However, they did not address COVID-19-related cancer treatment cancellations and their impact on cancer patients' psychological health in LMICs such as Nigeria. Investigating COVID-19-related cancer treatment cancellations and their influence on cancer patients' psychological health helps establish how cancer patients in low- and middle-income countries deal with stress, engage with providers, and make cancer treatment decisions.

While disruptions in oncology care may cause patients to be concerned about their disease progression, resulting in major psychological health implications, this is not true for all oncology patients. Our analysis showed that cancer patients who had chemotherapy were less likely than those who did not receive chemotherapy to experience psychological health issues resulting from COVID-19. Exploring the psychological impact of COVID-19 on people living with chronic diseases including cancer in Ethiopia showed that over 77% of the population reported little to no effect on their psychological functioning.[9] This finding can be attributed to possible ignorance of the pandemic in this region, or it could also be associated to limited COVID-19 cases in this region.[9] Hence, it is important to consider the specific contexts and medical care environments when evaluating the psychological impacts of pandemic-related oncology care disruptions. Such factors can significantly mediate the experiences of stress and anxiety typically associated with treatment delays and cancellations. Additionally, participants of another study who had their curative surgeries delayed owing to the COVID-19 pandemic reported little to no effect on their access to healthcare.[19] Interestingly, these groups of participants reported low-to-medium effects of the pandemic on their psychosocial functioning including fear, anxiety, quality of sleep, depressive symptoms, and overall quality of life.[19] This is a remarkable finding, because it is expected that the direct effect of their treatment delay as a result of the pandemic will compound the negative strain on their emotions, as some of the findings in our study reveal. Another study among breast cancer patients and survivors found COVID-19 had no effect on the current treatment and aftercare of 73% of the study participants.[20] It also identified that a third of the participants contacted their general practitioner less easily as result of the ongoing pandemic.[20] This is a worrisome finding, as it can potentially result in reduction in diagnoses of complications of their cancer and adverse effects of current therapy. Although a significant proportion of participants (84%) reported no change in threshold for contacting their breast cancer physician, a third of participants reported worrying about their financial situation, and a decrease in emotional functioning of participants before and during the pandemic was observed.[20] Our findings suggest treatment delays due to the pandemic might have exacerbated the psychological strain on cancer patients; however, this relationship appears to have been influenced by multiple factors such as regional pandemic severity, type of cancer, and specific treatment modalities received. Further studies are needed to definitively establish causality and explore the underlying mechanisms.

Psychological depression, isolation, anxiety, and insomnia have been identified as the most common psychological disorders among cancer patients during COVID-19 by researchers in several studies.[7,31,34] COVID-19 added to people's tension and anxiety, especially those who were diagnosed with cancer. Anxiety caused by COVID-19 is a natural and expected response to the scenario during the pandemic. Although anxiety was heightened in many individuals, it could be particularly perplexing for cancer patients, who may have hesitate to continue treatment for fear of infection or worsening their health.[34] Furthermore, because the end date of the pandemic was unknown, resolving those concerns was a top priority, as they might have a severe impact on an individual's and society's health. COVID-19-induced anxiety did affect the patient's therapeutic decisions.[35]

Study limitations

Our study's strengths and limitations should be noted. First, self-reporting forms of psychological health impacts, including mental health of COVID-19 rather than clinical diagnosis, is a critical element, which may contribute to underreporting and recall bias. Second, different forms of psychological health impacts of COVID-19 were used as a proxy for psychological health outcomes for each type and in combination, and because this study did not employ established psychological health scales or assessment tools, it is possible that some episodes commonly associated with psychological health were eliminated. The use of more validated assessment instruments for assessing psychological health impacts would lead to a better understanding of research findings and would improve research comparability and replicability.[36] Third, due to our sample frame, the analysis excluded those patients who did not visit the clinics throughout the study period, children (those under the age of 18), and patients who had never been diagnosed with cancer. COVID-19 may have caused psychological health consequences in these cases, which may or may not have been related to treatment cancellation. Furthermore, while this study did not directly assess the participants' past psychiatric history, future research could investigate the longitudinal psychological impacts of treatment cancellations, considering both previous mental health conditions and the immediate stressors introduced by the COVID-19 pandemic. This approach would help clarify the extent to which past psychiatric conditions influence current psychological outcomes in the context of oncology care disruptions. Finally, because the study is unweighted, the findings may not be generalizable, and while the study gives novel information on associations, the findings do not demonstrate causality due to the study methodology (cross-sectional or observational study), which cannot be used to infer causality.[37,38] However, in terms of strengths, multiple types of psychological health impacts were included: feeling down, uncertain, and/or stressed due to COVID-19; being concerned about inability to access treatment; being concerned about visiting limitations and being unable to be with family; and feeling discriminated by doctors/nurses due to social distancing in the hospital. The self-reporting facilitated a large sample of patients providing candid responses, offering insights into the impact of COVID-19 on the psychological health of cancer patients in Nigeria, a low and middle-income country. This data is invaluable for educating medical professionals and individuals in similar economic contexts about the challenges faced by oncology patients during the pandemic. These impacts and events were controlled for a variety of possible confounding variables: patient's religion, ethnicity, income, cancer diagnosis/type, and cancer treatment received.

Implications of our findings

Our findings underscore the necessity of proactive strategies to ensure the continuity of cancer care during pandemics, particularly in low and middle-income countries like Nigeria. Such measures include the development of emergency protocols that prioritize essential treatments and maintain comprehensive care, thus mitigating the psychosocial impacts of treatment cancellations.[31] Furthermore, it is crucial to prepare for unavoidable treatment cancellations by enhancing psychological support, as these can exacerbate anxiety and depression among patients, adversely affecting their outcomes.[34] In regions where pandemic management is poor, strengthening psychological support systems and ensuring the availability of mental health services are critical to mitigating negative outcomes.[34] Besides anxiety and depression, our recommendations for psychological support also encompass a broader range of disorders, including stress-related disorders and other emotional disturbances that may arise due to the pandemic's impact on cancer care.[31] This comprehensive approach is essential for addressing the psychological health of oncology patients effectively.

To address psychological distress among cancer patients, we emphasize various interventions including coping support, informed decision-making, and prioritization based on the malignancy type and treatment protocols. These measures aim to mitigate the negative impacts of COVID-19 on patient care by enabling timely and relevant treatment adjustments.[39,40] Telemedicine emerged as a vital tool in this context, effectively reducing patient anxiety through remote consultations and behavioral psychotherapy.[41] In Canada, text messaging and cost-effective population-based strategies have proven successful in alleviating distress among cancer patients during the pandemic.[42] It is important to note, however, that while telemedicine is being adopted globally, its access remains limited in low-resource settings, and some resistance to technology utilization persists even where it is available.[43]

Conclusion

In conclusion, our findings show that more than half of a sample of predominantly adult female cancer patients experienced significant psychological health consequences as a result of COVID-19. Cancer patients who had at least one treatment cancellation had a much higher risk of psychological health effects than those who had no treatment cancellations. Our research has emphasized the psychosocial effects of COVID-19 on cancer patients, and with the emergence of new strains of the virus, measures are needed to continue mitigating this impact. As a result, health care professionals and cancer treatment facilities in LMICs should prioritize and incorporate psychological care and counseling into their patients' treatment plans. However, it is important to remember that the relationship between COVID-19-related treatment cancellations and the psychological health of oncology patients is dependent on a number of factors, including possible ignorance of the pandemic or limited COVID-19 cases in specific regions around the world, the type of cancer, and the type of cancer treatment received.

Acknowledgments: The authors would like to thank Marie Fleisner of the Marshfield Clinic Health System for editorial assistance with this manuscript.

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