



Research article

Psychological impacts of COVID-19 pandemic in cancer patients on active treatment



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HIGHLIGHTS

- Examined 385 cancer patients under active treatment during the COVID-19 era.
- Investigated Post-traumatic stress disorder (PTSD) symptoms, depression, anxiety, stress, and associated sociodemographic/clinical characteristics.
- Performed depression-anxiety-stress-scale-21 (DASS-21) for mental states, Impact of Event-Scale-Revised (IES-R) for psychological effects of Covid-19.
- Being single, having relatives died of COVID-19 and being under psychiatric medication before the pandemic give tendency to depression and anxiety.

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ABSTRACT

Introduction: Although cancer patients have a high risk of exposing COVID-19 and developing severe complications, they have to receive active treatment. We aimed to determine the psychological conditions of cancer patients and shed light on the establishment of early psychological intervention and intervention policies by making specific recommendations.

Method: We consecutively evaluated 385 cancer patients under treatment. Post-traumatic stress disorder (PTSD) symptoms, depression, anxiety, stress, and associated sociodemographic/clinical characteristics were investigated. In addition, we applied depression-anxiety-stress-scale-21 (DASS-21) for the mental states of patients and Impact of Event-Scale-Revised (IES-R) for the psychological effects of Covid-19.

Results: The mean age was 58 (18–88). 47.2% were psychologically distressful per DASS-21, and 39.3% were traumatic per IES-R scores. 71.9% stated the risk of getting COVID-19 was high since they had cancer, and 82% stated serious complications would develop if they had COVID-19 infection. Patients diagnosed for more than one year were more stressed, anxious, and depressive (p -value = 0.001, 0.003, 0.049, respectively). Singles were more stressed, depressed, and traumatized than couples (p -value = 0.001, 0.011, 0.001). In multivariate analysis, a significant correlation with being under psychiatric treatment before the pandemic was found for depression (OR: 3.743, 95 %CI: 1.790–7.827) anxiety (OR: 3.776–95 %CI: 1.945–7.332) and stress levels (OR: 4.129, 95 %CI: 1.728–9.866). Having relatives who died or received treatment for COVID-19 (OR: 0.515, 0.296–0.895) and being unmarried (OR: 2.445–95% CI: 1.260–4.747) predicts PTSD development.

Conclusions: When the psychological effects of the COVID-19 pandemic are manifesting strongly, cancer patients' anxiety and exposure levels are high. It is of great importance that clinicians understand needs, recognize psychological distress, and direct them to relevant departments for supportive care.

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1. Introduction

The World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) a pandemic on March 11, 2020. In Asia, China was the first country that was affected by COVID-19. Although it might be seen in other places outside China, it was not identified before the end of 2019 [1]. The first COVID-19 case in Turkey was detected on March 11, 2020, and as of May 2020, it has its first peak in Turkey. The COVID-19 pandemic is unique and frightening due to its high rate of spread, potential infectivity, and lack of effective treatment [2]. Widespread pandemic infectious diseases cause psychological distress and mental symptoms in society [3]. Fear, anxiety, and depression are common psychological problems in pandemics [4]. Thus, during the COVID-19 pandemic, there were reports of psychological distress, anxiety, depression, and symptoms of post-traumatic stress disorder among the general populations of Americans, Asians, Europeans, Arabs, and Turks [5, 6, 7, 8, 9]. Xiong et al. Reported in their systematic review high rates of symptoms of anxiety (6.33%–50.9%), depression (14.6%–48.3%), post-traumatic stress disorder (7%–53.8%), psychological distress (34.43%–38%), and stress (8.1%–81.9%) were reported in the general population during the COVID-19 pandemic [10]. These outcomes show that the COVID-19 pandemic seriously affected mental health and led us to protect physical and mental health, which should be the governments' priority. As Lee et al. mentioned in their meta-analysis, to protect mental well-being and mitigate psychological issues of the general population, governments have to do assessments and interventions that reduce uncertainty and implement stringent policies promptly [11].

Changes in daily life patterns, school closures, sudden shifts from home to work, travel restrictions, anxiety about losing a job, and the possibility of something negative experienced by their relatives, quarantine, self-isolation, and uncertainty about social life, economic security, or to get infected and die can cause these mental symptoms. We know that the tensions and fears that originated from the epidemic, mass quarantines, and economic recession are predicted to increase suicide and suicide-related mental disorders [10].

High rates of neuropsychiatric symptoms (fatigue, depression) among individuals affected by COVID-19 have been reported [12, 13]. Mood disorders exhibiting evidence of dysregulated immune function have been replicated in some studies [14, 15]. Furthermore, COVID-19 is known to be a hyperinflammatory state. In line with this, a recent systematic review has demonstrated that the frequency of depressive symptoms 12 weeks following SARS-CoV-2 ranged from 11 to 28% [16]. As a result, we can say depression is a significant outcome among survivors of the COVID-19 pandemic.

Those with pre-existing mood disorders are at higher risk of COVID-19 hospitalization and COVID-19-related death [17]. At the same time, we know that pre-existing obesity, cardiovascular diseases, diabetes, and cancers are risk factors for severe COVID-19 [18,19].

Cancer patients are perceived as vulnerable and at an increased risk of contracting severe COVID-19 illness because of their immunocompromised status and chronic disease. Studies on this subject have shown that vulnerable groups (having a chronic illness) for COVID-19 infection were associated with high distress [20]. Also, the high-risk perception was found to be correlated with psychological symptoms [21].

Tee A. et al. investigated the psychological effects of covid-19 in SLE and RA patients who are more prone to COVID-19 infection because of their immunocompromised situation. For example, there was moderate to severe anxiety in 38.7% and moderate to severe depression in 27% [22]. There was no research that investigated the mental state of cancer patients in Turkey at the time of our study, in which we searched for the literature. Cancer patients are a particular group that should be addressed in terms of the psychological and social effects of the disease during the COVID-19 pandemic. In addition to these adverse effects of the pandemic revealed in studies, a cancer diagnosis itself is a life-threatening, psychologically weakening, and wearing condition [23]. Cancer patients have been caught in the dilemma of applying to the

hospital and continuing the treatment or staying at home and risking being untreated regarding the risk of COVID-19 infection. The pandemic has added a distressing and uncertain process to this chronic, devastating condition such as cancer. Unfortunately, there is limited information yet on how COVID-19 affects cancer patients [24]. Our study is the first multicenter study in Turkey that evaluates the mental states of cancer patients undergoing active treatment during the pandemic. Understanding how this group of patients is affected by the neuro-psychologically and mental processes is vital to meet their current situation and future needs. This study tried to define how patients were affected by the COVID-19 process through their symptoms of depression, anxiety, trauma, and related factors (sociodemographic characteristics). Finally, we believe the data we obtained will guide clinicians in addressing the mental states of cancer patients in widespread outbreaks.

2. Materials and methods

Our study is a cross-sectional, descriptive, observational multicenter survey study. Participants are patients receiving active chemotherapy in Medical Oncology clinics in 3 centers (Istanbul Medeniyet University; Umraniye Training and Research Hospital (TRH), Süreyyapaşa TRH) in Istanbul.

While strict curfews were implemented in Istanbul between May 2020 and Jun 2020, approximately 385 literate patients over the age of 18 to fill out the forms were included in the study. Patients with mental retardation, alzheimer dementia, and psychotic disorders were excluded. Clinicians asked the patients about these situations if they were diagnosed with schizophrenia or mental retardation. Also, clinicians checked from the national health database (e-nabiz) for the diagnoses that were in exclusion criteria such as mental retardation (F70,71,72), schizophrenia (F20) or alzheimer dementia (G30). Questionnaires (psychiatric scales) were administered by the responsible doctor conducting the research to the patients under active treatment during the pandemic who applied to the out-patient clinic for chemotherapy, targeted therapy, and immunotherapy in each one or two or three weeks periods.

In addition to the sociodemographic data test, the patients who accepted to participate in the study were given DASS-21 and Revised Impact of Events Scales (IES-R) to see the psychological effects of the COVID-19 pandemic on patients undergoing cancer treatment. Patients were asked to fill the questionnaire survey in 48 h in one go after the therapy. In the next therapy session, they were asked to bring the tests, which lasted approximately 20–30 min. At the end of two months, all survey forms were collected by the corresponding author, and the data were transferred to a computer by himself manually. After the data was entered manually, data editing was performed to eliminate possible errors. All three centers performed the same protocol.

Ethics committee approval was obtained from Istanbul Medeniyet University Göztepe Training and Research Hospital.

Sociodemographic data were collected, including age, gender, socioeconomic status, marital status, educational status, comorbid medical diseases, and history of mental disorders. In addition, the cancer type, cancer duration, and treatment type (palliative-curative) were recorded.

Participants were asked to answer five questions prepared by researchers about their concerns regarding COVID-19 and whether they needed psychological support. A Likert-type scale was given. Each question was enumerated for the answers (1-no, 2-mild, 3-moderate, 4-severe, 5-extremely severe). The questions asked were;

1. whether the patients thought their risk of contracting COVID-19 was higher because they are cancer patients
2. whether they believed that they might have severe complications if they had covid 19 infection
3. whether they are Afraid of taking chemotherapy during the COVID-19 pandemic
4. whether they worry that their chemotherapy might be halted in the event they contract COVID-19

5. whether they needed psychological support regarding their illness during the COVID-19 pandemic

Patients rated their answers over 5 points. In addition, patients were asked whether they had relatives who were treated or died due to COVID-19.

2.1. Impact of event Scale-Revised (IES-R)

The psychological impact of the COVID-19 pandemic was measured using the Impact of Event Scale-Revised (IES-R) based on previous studies [8, 25, 26]. The IES-R measures subjective responses to stressful life events such as illness, accidents, crises, and disease outbreaks and has been well validated for populations [27, 28, 29]. The Turkish validity and reliability study of the effect of events scale was conducted by Çorapçıoğlu et al. [30]. IES-R is a self-administered questionnaire that has been well-validated in the Turkish population about the extent of psychological impact after exposure to the public health crisis. Also, it has been used in previous studies to understand the psychological impact of the COVID-19 pandemic [8, 31, 32, 33].

The total IES-R score was divided into 0–17 (normal), 18–23 (PTSD-like symptoms), and >24 (diagnosis of PTSD) [34].

2.2. Depression, anxiety, and stress scale (DASS-21)

Mental health status was measured using the DASS-21, also used based on previous studies [8]. Moreover, the DASS-21 scale was used in earlier research on American, European, and Asian populations during pandemics [5, 8, 31, 35].

The validity and reliability studies of the Turkish version of the DASS-21 were performed by Sarıçam et al. in 2018. The conclusion was that the scale was a valid and reliable instrument for assessing depression, anxiety, and stress levels [36]. The scores were calculated based on the previous studies [9].

This scale comprises three subscales; depression, anxiety, and stress. The total score of the depression subscale score was subdivided into average (0–9) and ≥ 10 depressive symptoms. The total score of the anxiety subscale was subdivided into normal (0–6) and ≥ 7 as anxiety symptoms. The total score of the stress subscale was subdivided into 0–10 for normal and ≥ 11 for stress symptoms.

Our study did not classify depression, anxiety, or stress as mild, moderate, severe, or extremely severe.

3. Statistics and methods

Data were analyzed using SPSS version 25 (SPSS Inc., Chicago, IL). Descriptive statistics were made using frequencies and percentages for demographic data. The participants' anxiety, depression, stress, and trauma status were evaluated with DASS-21 and IES-R.

The proportions of patients with anxiety, depression, and stress were presented by gender being over 65 years old, marital status, having children, income, comorbidities, frequency of chemotherapy, cancer type, cancer treatment intention, elapsed time since initial cancer diagnosis, having mental illness before the pandemic and having any relatives who have suffered from COVID-19 infection by using cross-tabulation. The Chi-square test or Fishers' exact test (when Chi-square test assumptions do not hold due to low accepted cell count), where appropriate, was used to compare these proportions in different groups. A p-value of less than 0.05 was considered to show a statistically significant result. The possible factors identified with univariate analyses (Chi-square test) were further entered into a logistic regression analysis to determine independent predictive factors. The p values of Tables 3, 4, 5, and 6 are the p values of the chi-square test. Therefore, since there are discrete random variable analyzes, it is possible to see the group that differs by percentage. Continuous variables were not used in the analyses. Since they do not show a normal distribution, they have been transformed into

categorical variables. In addition, the interpretation of categorical variables is more appropriate for psychological definitions. Therefore, Bonferroni corrections were not applied.

4. Results

Clinical and sociodemographic characteristics: 385 patients completed the present study. The median age was 58 (18–88). % 49.4 of the participants were female, % and 83.6 were married. %41.8 were diagnosed with lung cancer, 39.5% received adjuvant/neoadjuvant treatment, and 60.5% received palliative treatment. 38.4 % of patients had additional comorbidities. %18.4 of patients had a psychiatric history before the pandemic. About %19 of the participants had relatives that recently died of COVID-19 or were under treatment for COVID-19. The demographics and clinical characteristics of the patients are provided in Table 1.

Results of **psychological impact (IES-R) and mental health status (DASS-21):** The average score of the participants on the revised impact of

Table 1. Sociodemographic and clinical characteristics of the participants.

Characteristics	n	%
Age		
<65	277	72
≥ 65	108	28
Gender		
Male	195	50.6
Female	190	49.4
Marital status		
Single	63	16.4
Married	322	83.6
Education levels		
Primary school	218	56.6
Middle School/High school	130	33.8
University	37	9.6
Has children		
Yes	353	91.7
No	32	8.3
Income		
Lower	112	29.1
Middle-upper	273	70.9
Comorbidities		
Yes	148	38.4
No	237	61.6
Frequency of chemotherapy		
≤ 2 weeks	210	54.5
≥ 3 weeks	175	45.5
Cancer type		
Lung	161	41.8
Breast	114	29.6
Others	110	28.6
Cancer treatment		
Curative (adj/neoadj?)	152	39.45
Palliative (met/ktf?)	233	60.5
Time since initial cancer diagnosis		
≤ 12 month	247	64.2
> 12 month	138	35.8
Mental health treatment before pandemic		
Yes	63	16.4
No	322	83.6
Do you have any relatives who died or got treatment due to COVID-19?		
yes	73	19
no	312	81

event scale questionnaire was 20.5 (± 15.89). 39.3% of the participants' IES-R scores were ≥ 24 , showing a PTSD diagnosis.

The mean DASS-21 total score was 14.97 ± 12.1 . On the DASS-21, % 85.4 had standard scores on the depression subscale, 74.8% had standard scores on the anxiety subscale, and 83% had standard scores on the stress subscale (Table 2).

Clinical and sociodemographic variables associated with psychological impact and mental health status: There was no significant association between age group ($<65, >65$) and sexual difference (female, male) correlated with dependent variables of IESR scores or DASS-21 subscales. When the age group ($<65, >65$) or sexual difference (female, male) correlated between dependent variables, no significant associations were found between IESR scores or DASS-21 subscales.

In our study, singles were more depressive, traumatized, and stressed than married ones (p -value = 0.001, 0.011, 0.001 respectively).

Participants having a cancer diagnosis longer than one year are more stressed, anxious, and depressive (p -value = 0.001, 0.003, 0.049 respectively) than participants who were diagnosed with cancer in one year.

Participants who had gone under psychiatric treatment before the pandemic were more stressed, anxious, depressed, and traumatized (p -value = 0.000, 0.000, 0.000, 0.000, respectively).

We found that the low education level is associated with more anxiety and depressive symptoms (p -value = 0.000, 0.036 respectively).

While participants with comorbidities plus cancer had more depressive symptoms ($p = 0.001$), patients whose relatives recently died of COVID-19 or were under treatment due to COVID-19 were more traumatized ($p = 0.03$).

We did not find any significant correlation between other study variables with IES-R and DASS-21 scores.

Sociodemographic and clinical factors associated with DASS-21 and IES-R scores were presented in (Tables 3, 4, 5, and 6).

According to the results of the multiple regression analysis, low education level (OR; 0.107, 95% CI: 0.014–0.837, $p = 0.033$), presence of comorbid diseases (OR: 2.191, 95% CI: 1.162–4.132, $p = 0.015$), and had psychiatric treatment before the pandemic (OR; 3.743, 95% CI: 1.790–7.827, $p = .000$) was found to be an independent predictive factor for depression.

Low education level (OR:0.389-%95 CI:0.220–0.687, $p = .000$), having psychiatric treatment before the pandemic (OR:3.776-%95CI:1.945–7.332, $p = .000$), and having cancer diagnosis more than one year (OR:0.238, %95CI:0.310–0.996, $p = 0.027$) was found to be an independent predictive factor for anxiety.

Table 2. Results of DASS-21 and IES-R scores.

	N	%
Mean IES-R:	20.5 (± 15.89)	
Presence of PTSD symptoms		
No PTSD like symptoms<17	183	47.5
Presence of PTSD like symptoms>18	51	13.2
Diagnosis of PTSD ≥ 24	151	39.3
IES-R intrusion(M):	7 (± 5.99)	
IES-R avoidance(M):	7.98 (± 6.07)	
IES-R hyperarousal(M):	5.51 (± 4.82)	
DASS21 Anxiety(M)	4.21 $\pm$ 3.86	
No(0–6)	288	74.8
≥ 7 has anxious symptoms	97	25.2
DASS21 Depression(M):	4.45 $\pm$ 4.36	
No(0–9)	329	85.4
≥ 10 has depressive symptoms	56	14.6
DASS21 Stres (M):	6.31 $\pm$ 4	
No(0–10)	356	83
≥ 11 has stress symptoms	29	17

Table 3. Association between sociodemographic/clinical variables with DASS-21 DEPRESSION subscale.

Features	No depression (n)	Has depressive symptoms (n)	Depression score (mean ± SD)	p value
Sex				
male	162	21	3.96 ± 4.4	0.113
female	167	35	4.91 ± 4.3	
Age				
<65	234	43	4.68 ± 4.5	0.425
≥65	95	13	3.87 ± 3.9	
Marital status				
Single	47	16	5.44 ± 4.9	0.011
Married	282	40	4.26 ± 4.2	
Education levels				
Primary	179	39	4.89 ± 4.8	0.036
Middle/High	114	16	4.05 ± 3.7	
University	36	1	3.30 ± 3.5	
Has children				
Yes	302	51	4.40 ± 4.4	0.796
No	27	5	5.03 ± 4.4	
Income				
Lower	98	14	4.72 ± 5.0	0.527
Middle/upper	231	42	4.34 ± 4.1	
Comorbidities				
Yes	115	33	5.33 ± 5.1	0.001
No	214	23	3.91 ± 3.7	
Frequency of chemotherapy				
≤2 weeks	188	22	4.22 ± 4.3	0.014
≥3 weeks	141	34	4.73 ± 4.4	
Cancer type				
Lung	140	21	4.44 ± 4.5	0.558
Others	189	35	4.46 ± 4.2	
Cancer treatment				
Curative	126	26	4.66 ± 4.3	0.301
Palliative	203	30	4.32 ± 4.4	
Duration since initial cancer dx				
≤12 month	218	29	4.09 ± 3.9	0.049
>12 month	111	27	5.10 ± 5.0	
Mental health treatment before pandemic				
Yes	24	18	7.37 ± 4.6.	0.000
No	305	38	3.89 ± 4.1	
Do you have any relatives who died or got treatment due to covid-19?				
yes	62	11	5.36 ± 3.9	0.855
no	267	45	4.24 ± 4.4	

For stress; being single (OR:2.598, %95CI:1,072–6,298, $p = 0.034$), having psychiatric treatment before pandemic (OR:4.129, %95CI:1,728–9,866, $p = 0.001$) and having cancer diagnosis more than one year (OR:2.999, %95CI:1,298–6.930, $p = 0.01$) were found independent predictive factors.

Being single (OR:2.445-%95CI:1.260–4.747, $p = 0.008$) and having relatives or friends who died or got treatment due to COVID-19 (OR:0.515,0.296–0.895, $p = 0,019$) were independent predictive factors for traumatization.

Worries Questions: 71.9% of the patients think that their risk of contracting COVID-19 is high because they are cancer patients, and 82% believe that in case of infection, their health would seriously be endangered. While 36.3% fear receiving chemotherapy during the pandemic, 63.6% are seriously worried that their chemotherapy will be interrupted if they become infected, and 20.7% think they need psychological support during the pandemic.

Table 4. Association between sociodemographic/clinical variables with DASS-21 ANXIETY subscale.

Features	no anxiety (n)	has anxiety (n)	anxiety score mean $\pm$ SD	P
Sex				
male	144	39	3.79 $\pm$ 3.5	0.101
female	144	58	4.59 $\pm$ 4.1	
Age				
<65	205	72	4.34 $\pm$ 4.0	0.603
$\geq$ 65	83	25	3.88 $\pm$ 3.5	
Marital status				
Single	44	19	4.90 $\pm$ 4.3	0.342
Married	244	78	4.07 $\pm$ 3.8	
Education levels				
Primary	145	73	4.77 $\pm$ 4.3	0.000
Middle/High	107	23	3.72 $\pm$ 3.2	
University	36	1	2.62 $\pm$ 2.6	
Has children				
Yes	263	90	4.23 $\pm$ 3.9	0.832
No	25	7	3.97 $\pm$ 3.8	
Income				
Lower	81	31	4.21 $\pm$ 3.7	0.518
Middle/upper	207	66	4.21 $\pm$ 3.9	
Comorbidities				
Yes	104	44	4.72 $\pm$ 4.1	0.117
No	184	53	3.89 $\pm$ 3.7	
Frequency of chemotherapy				
$\leq$ 2 weeks	163	47	4.00 $\pm$ 3.4	0.195
$\geq$ 3 weeks	125	50	4.46 $\pm$ 4.3	
Cancer type				
Lung	122	39	4.22 $\pm$ 3.4	0.723
Others	166	58	4.20 $\pm$ 4.2	
Cancer treatment				
Curative	106	46	4.69 $\pm$ 4.2	0.072
Palliative	182	51	3.90 $\pm$ 3.6	
Time since initial cancer diagnosis				
$\leq$ 12 month	197	50	3.91 $\pm$ 3.6	0.003
>12 month	91	47	4.75 $\pm$ 4.2	
Mental health treatment before pandemic				
Yes	18	24	6.44 $\pm$ 4.2	0.000
No	270	73	3.77 $\pm$ 3.6	
Has any relatives who died or got treatment due to covid-19?				
yes	51	22	5.27 $\pm$ 3.5	0.296
no	237	75	3.96 $\pm$ 3.9	

The elderly ($p = 0.036$), lung cancer patients ($p = 0.016$), and males ($P = 0.004$) were significantly more worried about developing severe complications if they have COVID-19 infection.

5. Discussion

The uncertainty of COVID-19 and the severe course of clinical complications in cancer patients bring psychological side effects that worsen the patients' condition [37]. In this study, we investigated the psychological status, associated clinical characteristics, and sociodemographic factors of patients who received active chemotherapy between May and June 2020, two months after the first case was seen in Turkey when the epidemic peaked in the first wave and the quarantine and isolation practices were the hardest. When we evaluated according to the cut-off scores (dass total), we found that 47.2% were in psychological distress according to dass total scores, 25.2% were anxious, 14.6% were depressive, 7.5% were stressed; also, 39.3% of the participants were

Table 5. Association between sociodemographic/clinical variables with DASS-21 STRESS subscale.

Features	No Stress (n)	Stres var (n)	Stress score (mean ± SD)	P-value
sex				
male	172	18	6.07 ± 4.8	0.336
female	184	11	6.52 ± 5.0	
age				
<65	253	24	6.6 ± 4.9	0.204
≥65	103	5	5.55 ± 4.7	
Marital status				
Single	51	12	7.16 ± 6.1	0.001
Married	305	17	6.14 ± 4.6	
Education levels				
Primary	198	20	7.07 ± 5.1	0.296
Middle	122	8	5.45 ± 4.3	
University	36	1	4.81 ± 4.3	
Has children				
Yes	328	25	6.32 ± 4.9	0.285
No	28	4	6.16 ± 5.0	
Income				
Lower	105	7	6.61 ± 5.0	0.672
Middle/upper	251	22	6.14 ± 4.8	
Comorbidities				
Yes	127	21	7.54 ± 5.6	0.556
No	229	8	5.54 ± 4.2	
Frequency of chemotherapy				
≤2 weeks	198	12	6.02 ± 4.7	0.175
≥3 weeks	158	17	6.65 ± 5.1	
Cancer type				
Lung	150	11	6.49 ± 4.8	0.700
Others	206	18	6.17 ± 4.9	
Cancer treatment				
Curative	139	13	6.47 ± 5.0	0.558
Palliative	217	16	6.20 ± 4.8	
Time since initial cancer diagnosis				
≤12 month	237	10	5.88 ± 4.4	0.001
>12 month	119	19	7.07 ± 5.5	
Mental health treatment before pandemic				
Yes	28	14	9.13 ± 5.7	0.000
No	328	15	5.75 ± 4.5	
Do you have any relatives who died or got treatment due to covid-19?				
yes	67	6	6.64 ± 4.5	0.806
no	289	23	6.23 ± 5.0	

traumatic according to IES-R cut-off scores. These findings indicate that the COVID-19 pandemic is a new stressor for cancer patients prone to physical and psychological trauma [38].

According to the multinational studies investigating the mental health outcomes of the COVID-19 pandemic in Americans, Asians, and the general European population, China was the first country with the highest IES-R score (mean 32.54, SD = 0.52). Pakistan was the first country with the highest DASS-21 scores (depression (mean 11.70, SD = 0.56), anxiety (mean 8.81, SD = 0.48), stress (mean 14.41, SD = 0.56) [5].

Wang cuiyan et al. researched the mental and physical health impact of the COVID-19 pandemic in Asian countries (China, Iran, Malaysia, Pakistan, Philippines, Vietnam, Thailand) using the same scales (DASS-21, IES-R) to measure the impact of the pandemic on mental health [6]. Thailand had the highest scores in IES-R (42.35, SD = 13.39), DASS-21 stress, anxiety, depression scores (21.94, SD = 7.74–18.66, SD = 5.98–19.74, SD = 6.94) respectively and Vietnam had all the lowest

Table 6. Association between sociodemographic/clinical variables with IES-R.

	No ptsd symptoms (n)	Presence of ptsd like symptoms (n)	Diagnosis of ptsd (n)	Ies-r points mean ± SD	P value
Sex					
male	91	28	64	19.52 ± 16.1	0.110
female	79	36	87	21.39 ± 15.5	
Age					
<65	113	51	113	21.34 ± 16.0	0.080
≥65	57	13	38	18.33 ± 15.3	
Marital status					
Single	27	20	16	19.19 ± 15.3	0.001
Married	143	44	135	20.75 ± 16.0	
Education levels					
Primary	91	39	88	21.03 ± 15.5	0.214
Middle/High	56	22	52	19.92 ± 15.6	
University	23	3	11	19.38 ± 18.3	
Has children					
Yes	157	57	139	20.44 ± 15.8	0.703
No	13	7	12	21.19 ± 16.4	
Income					
Lower	50	17	45	22.51 ± 18.5	0.885
Middle/upper	120	47	106	19.67 ± 14.5	
Comorbidities					
Yes	69	26	53	20.99 ± 17.1	0.556
No	101	38	98	20.19 ± 15.0	
Frequency of chemotherapy					
≤ per 2 weeks	90	35	85	20.00 ± 15.6	0.834
≥per 3 weeks	80	29	66	21.09 ± 16.1	
Cancer type					
Lung	76	25	60	20.0 ± 16.3	0.591
Breast	94	39	91	20.86 ± 15.5	
Others					
Cancer treatment					
Curative (adj/neoadj?	59	24	69	21.7 ± 15.4	0.124
Palliative (met/ktf?	111	40	82	19.71 ± 16.0	
Time since initial cancer diagnosis					
≤12 month	106	37	104	21.11 ± 16.1	0.244
>12 month	64	27	47	19.40 ± 15.2	
Mental health treatment before pandemic					
Yes	9	17	17	26.62 ± 17.0	0.000
No	161	47	134	19.30 ± 15.3	
Do you have any relatives who died or got treatment due to covid-19?					
yes	20	13	40	23.45 ± 13.1	0.03
no	150	51	111	19.81 ± 16.3	

scores in terms of mean iesr (17.39,SD = 1,24), dass depression (2.28,SD = 0.49), anxiety (2.10,SD = 0,44), stress (3.80,SD = 0.53) suggesting Vietnam had the lowest mean scores in IES-R and DASS-21 areas [5].

In our study mean IES-R (20.5,SD = 15.89) and mean dass anxiety (4.21,SD = 3.86), stress (6.31,SD = 4), depression (4.45,SD = 4.36) scores were similar to Vietnams populations' outcomes [5, 6].

Consequently the interpretation of these two studies, researchers found significant differences in IES-R and DASS-21 scores between 7 countries ($p < 0.05$) and also between 8 countries [5, 6].

In a study involving 6213 cancer patients under the effect of the COVID-19 pandemic in China, depression was 23.4%, anxiety 17.7%, PTSD 9.3%, and hostility were seen in 3.5% of the participants [39]. In the study by Romito et al. evaluating the psychological distress of hemato-oncology patients, it was found that 36% met the criteria for anxiety, 31% for depression, and 36% fulfilled the diagnostic criteria for post-traumatic stress disorder (PTSD). In this study, the high scores of PTSD and anxiety, especially in young women, are remarkable [40]. However, our study found no significant difference in age and gender in

psychological distress (DASS-21 subscales) and PTSD (IES-R) measurements.

Depression is seen at a higher rate in cancer patients compared to the general population. The literature has reported that 0–38% of cancer patients have major depression [41]. Cancer patients have many triggers of anxiety, depression, and distress [42]. Zheng et al. found that the incidence of depression in cancer patients under the COVID-19 pandemic was 40.7%, affecting mood at 19.8%, sleep at 5.8%, and stress at 17.4% [43]. Our study surprisingly found that the depression rate during the COVID-19 pandemic was 14.6%; also, no relationship was found between the type of cancer and psychological distress under the influence of the COVID-19 pandemic. The prevalence of depression varying from 15–50% may also depend on the cancer type and measurement tools [41, 44]. It can also be concluded that patients do not establish a relationship between the COVID-19 pandemic and the risk of cancer that will affect their psychology. Alternatively, we can conclude that they perceive the COVID-19 danger as lower risk in addition to a concrete life-threatening stressor such as cancer. As a matter of fact, those who had someone who

died or received treatment due to COVID-19 ($p = 0.03$) were found to be more traumatized, but there was no increase in depression scores. However, conditions such as low self-esteem, poor physical conditions, psychological disease history, insufficient social support, and reduced functional capacity are considered risks for depression [42]. The fact that the patients' pain status and functional capacities were not evaluated in our study can be a limitation. However, all of our patients were those who applied to out-patient chemotherapy units for treatment, indicating that the sample had good functionality to a certain extent.

It has been emphasized that a low education level in cancer is correlated with emotional problems such as anxiety and depression [45]. In our study, low education level was a risk factor for depression and anxiety. In the literature, studies emphasize that depression and anxiety are more common in male cancer patients, as well as studies highlighting that they are gender-independent [43, 46, 47]. In our study, no significant difference was found in terms of gender. Fear and anxiety are expected in 17–46% of cancer patients, and unknown infectious agents manifest increased abnormal anxiety [48, 49]. Our study found that 25.2% of the patients have above the cut-off values for anxiety. Many reasons, such as perceived decreased social support, separation from loved ones, and uncertainty, are among the causes of anxiety. While we expected more anxiety, especially in cancer patients, due to many uncertain situations such as whether the disease will recur or how the treatment will progress, it was observed that the anxiety rate of cancer patients participating in our study did not increase much compared to pre-pandemic studies [50]. However, in our study, anxiety symptoms were found to be more common than depressive symptoms, as in the study of Kosir et al. [51].

In our study, patients with cancer for more than one year were significantly more stressed, anxious, and depressive ($P = 0.001, 0.003$). As the duration of cancer is prolonged, living with this disease and enduring its difficulties may increase psychological distress in individuals. In the studies of the Chinese investigating the epidemiology of mental states in cancer patients, being diagnosed with cancer for a long time was found to be associated with high PTSD, low anxiety, and depression, whereas in studies conducted on a healthy population, having the chronic disease was associated with higher scores in DASS21 and IES-R mean scores. As a matter of fact, those with comorbid chronic diseases who participated in the study scored high on the IES-R and DASS subscales (Depression, anxiety, stress) [8, 52].

In our study, the effect of receiving curative or palliative treatment on psychological distress was not significant. In fact, this finding contradicts the literature knowledge. Sigosky D et al. found that anxiety was high in cancer patients who received curative treatment and active systemic chemotherapy [50].

When the literature searched, it was emphasized that 74.9% of the studies conducted with cancer patients had one or more other diseases. There was a significant relationship between anxiety and depression in these patients [53]. Supporting this, 38.4% of cancer patients included in our study had non-cancer chronic diseases. The presence of comorbid diseases in our study was an independent predictive factor for depression in both univariate and multivariate analyses.

Fengry Hao et al. Examined whether psychiatric patients developed more psychiatric symptoms due to the COVID-19 pandemic and restrictions. The mean IES-R scores and mean DASS-21 subscales scores of psychiatric patients were higher than the average population [52]. Again, in a study by Abdulmajeed et al. Investigating the mental distress of the Arabic population, those with a psychiatric history had significantly higher DASS21 subscales and IES-R scores [9]. In our study, the DASS21 and IES-R scores of cancer patients who received psychiatric treatment before the pandemic were significantly higher in all measurements. It was an independent predictive factor for depression, anxiety, increased stress, and traumatization. In addition, a study on mental epidemiology in cancer patients in China found that psychiatric history is a risk factor for mental distress [39].

The most common psychological reaction in pandemics is uncontrollable fears, and it is known that COVID-19 fear is higher in cancer patients than in the general population without cancer [50]. In addition to the fear of epidemics, the belief that it is more susceptible to infection is a risk factor for conditions that increase anxiety [20]. From mild to severe, 71.9% of patients fear their risk of getting COVID-19 is high because they are cancer patients, while 82% think their health will be seriously endangered if they become infected. The knowledge that COVID-19 infection will result in higher mortality rates in advanced ages with cancer patients increases the fear of death in the elderly [54]. In addition, lung cancer and other smoking-related cancers have been associated with a complicated and severe course of COVID-19 [55]. In our study, if they are infected with COVID-19, the elderly ($p = 0.036$), lung cancer ($p = 0.016$), and male ($P = 0.004$) patients thought that severe complications would develop and their health would be significantly more endangered. We see that gender, age, and being diagnosed with lung cancer come to the forefront regarding the perception of COVID-19 causing death.

It is known that perceived uncertainty increases individual emotional distress and negatively affects the clinical outcomes of cancer patients. For example, studies conducted during the absence of a pandemic showed that social distance is an increased risk for adverse health outcomes and premature mortality [56]. Loneliness caused by individual restrictions applied during the COVID-19 epidemic is a psychosocial situation that can be addressed alone, which has also been associated with high mortality in cancer patients [57]. In a study by Mathew et al., loneliness was related to low mood and anxiety [58]. In another study by Elbay et al., investigating the distress level of healthcare professionals in Turkish society during the COVID-19 pandemic, it was found that married individuals and those with children had lower scores in psychological distress and DASS subscales [58]. In accordance with this data, being single was found to be significantly associated with increased stress, depressive symptoms, and traumatization in our study.

While the rate of cancer patients meeting the PTSD diagnostic criteria is low, the incidence of PTSD symptoms is common. Only the prevalence of cancer-related PTSD can range from 0 to 32% [59]. The fact that the rate we find is higher than expected can be considered the fear of being infected with COVID-19, and the increased risk of death can cause this. As a matter of fact, Forte et al. found 29.5% PTSD symptomatology in the Italian population in their study in which they investigated the effects of COVID-19 on the healthy population [60]. It is known that trauma exposure brings along much psychological distress and PTSD symptoms, and in the literature, PTSD had been most developed in patients who faced death [60, 61]. In our study, those who received treatment due to COVID-19 were an independent predictive factor for traumatization.

6. Conclusion and recommendations

As in previous pandemics, we know that COVID-19, directly and indirectly, affects mental health [62]. The pandemic affects the psychological well-being of people, and this impact may continue for a long time after the pandemic is over [63]. This study has shown that cancer treatment patients are at high risk for PTSD and psychological distress.

Psychological well-being is essential in dealing with the stress of cancer and pandemics on cancer patients: psychological assistance should be at the forefront, especially for those with additional mental illnesses, those who have been struggling with cancer for a long time, those with comorbid comorbidities, singles and those who have lost their relatives due to COVID-19: for this vulnerable group, early psychological measures may be beneficial.

As a result, it is crucial to evaluate patients' distress and intervene in the best possible way. The psychological needs of cancer patients should be considered, and awareness of this issue should be met by directing the patients to psychiatrists for detailed evaluation in the COVID-19 era.

Mental health centers require continuity in service (especially in vulnerable groups). Thus, it is essential to prospectively evaluate the effect of psychological distress seen in different subgroups on mortality.

Also, mental health professionals can offer online psychological interventions such as the Internet -Cognitive Behavioral Therapy (CBT) to improve the mental health of this population because CBT is the most evidence-based treatment/psychotherapy to reduce the psychiatric symptoms during COVID-19 [64,65]. With the COVID-19 pandemic, telepsychiatry is developing day by day. However, online visits overcome quarantine measures and distance, making internet-CBT cost-effective [66].

7. Limitations

The prolonged nature of the pandemic shows that its psychological effects will also be protracted and differentiated. However, the cross-sectional nature of our study may be insufficient to demonstrate the changes in anxiety, fear, and anxiety levels at different times of the pandemic. Also, it is a limitation that our study was performed in the early phase of the pandemic. In this sense, prospective studies will enable us to understand the ongoing effects of the pandemic better.

In our study, it is a deficiency that the effects of the participants' mental states on the treatment decisions (continuing/ending the treatment) or their quality of life and feelings of loneliness were not evaluated during the COVID-19 pandemic.

Obviously, vaccination is the only solution to overcome the COVID-19 pandemic today. It is known that chronic medical and psychiatric illnesses affect willingness to receive or pay for the COVID-19 vaccine. Another limitation is that we did not evaluate participants' vaccination status or willingness to accept the COVID-19 vaccine. Further studies would be required to examine how cancer patients willing to receive COVID-19 vaccination would affect their psychiatric disorder [67, 68].

We have only enrolled volunteer patients, and the patients who were unwilling to participate could not be evaluated, which can be accepted as a potential risk of sample bias. Furthermore, our outcomes are self-reported results. The patients performed tests independently with the questionnaire data that the mental health professional did not commit. Also, it is a limitation that while we evaluated concerns and risk perceptions against COVID-19, we did not assess participants' knowledge about COVID-19 or which precautionary measures against COVID-19 they take. For future research, protective and risk factors that may impact the mental health of cancer patients in pandemics should be studied and identified clearly.

Regardless of the outcome, mental health services should be provided to cancer patients on a continuous basis. However, in such difficult times, this service should be intensified for this vulnerable group of patients to overcome these severe problems. To cope with future pandemics, patients should be evaluated and supported by a team of mental health professionals.

Ethics committee approval

Istanbul Medeniyet University Göztepe Training and Research Hospital Clinical Research Ethics Committee (date: 30.04.2020, number: 2020/0214).

Declarations

Author contribution statement

Sinan Koca: Conceived and designed the experiments; Wrote the paper.

Esra Koca: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Ilker N Okten: Analyzed and interpreted the data.

Fatma F C Oregül, Akın Oztürk, Melike Özçelik, Abdilkerim Oyman, İbrahim Çil: Contributed reagents, materials, analysis tools or data.

Mahmut Gümüş: Analyzed and interpreted the data.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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