



Depression and anxiety in cancer patients before and during the SARS-CoV-2 pandemic: association with treatment delays

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Abstract

Purpose Pandemics can be associated with anxiety and depression in cancer patients who are undergoing treatment. In the present study, we aimed to perform a comparative evaluation of the conditions of cancer patients before and during the severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) pandemic using the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) to detect the impact of the pandemic on treatment delays that are associated with anxiety and depression in cancer patients. In addition, the effect of public transport use on treatment delays was examined.

Methods BDI and BAI were administered to 595 breast, ovarian, colon and gastric cancer patients before and during the pandemic. The questionnaires were administered by the physician blindly, who was unaware of the delay of the patients. The number of days by which the patients delayed their treatment due to the fear of contamination were recorded retrospectively. Correlation analyses were performed between the obtained scores and treatment delays.

Results The depression and anxiety levels in cancer patients were found to increase during the pandemic ($p=0.000$), and this increase was positively correlated with the disruption of their treatment ($p=0.000$, $r=0.81$). Depression and anxiety levels and treatment delays were higher in elderly patients ($p=0.021$). Depression and anxiety were more pronounced in female patients ($p=0.000$). Moreover, treatment delays were more common in patients who had to use public transportation ($p=0.038$).

Conclusion SARS-CoV-2 pandemic may increase anxiety and depression in cancer patients. This can cause patients to experience treatment delays due to concerns about becoming infected. At this point, if necessary, assistance should be obtained from psychiatric and public health experts.

Keywords Depression · Anxiety · Cancer patients · SARS-CoV-2

Plain English Summary

Pandemics could be associated with anxiety and depression in cancer patients who are undergoing treatment. In the present study, we aimed to perform a comparative evaluation of the conditions of cancer patients before and during the severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) pandemic using the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) to detect the

impact of the pandemic on treatment delays that are associated with anxiety and depression in cancer patients. BDI and BAI were administered to 595 breast, ovarian, colon and gastric cancer patients before and during the pandemic in 54 days interval. The number of days by which the patients delayed their treatment due to the fear of getting infected were recorded retrospectively, after the surveys completed. The depression and anxiety levels in cancer patients were found to increase during the pandemic, and this increase was positively correlated with the disruption of treatment by patients' preference. Depression and anxiety levels and treatment delays were higher in elderly patients. Depression and anxiety were more pronounced in female patients. Moreover, treatment delays were more common in patients who had to use public transportation. SARS-CoV-2 pandemic may increase anxiety and depression in cancer patients. This

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situation may prevent patients from participating in treatment due to contamination concerns.

Introduction

The severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2) outbreak is the most important and widespread pandemic of the century. The epidemic started in December 2019, spread rapidly to large clusters of patients with clinical presentations of acute respiratory distress syndrome (as officially announced on 7th January) and rapidly became a pandemic in the following period [1–3]. New adaptive plans are being developed each day for the examination, treatment and follow-up of patients with acute and chronic diseases in hospitals during the SARS-CoV-2 pandemic [4]. The health authorities announced the first case of SARS-CoV-2 on 11th March 2020 in Turkey [5].

The development of cancer is etiologically associated with immune malfunction [6]. In addition, the vast majority of agents used in cancer treatment cause immunodeficiency [7]. The ages of most cancer patients were over 65 years old [8] who were in the risk category for SARS-CoV-2 [9]. Liang et al. evaluated 18 cancer patients who underwent chemotherapy or surgery in the previous month and found that cancer patients infected with COVID-19 are at 3.5 times the risk of requiring mechanical ventilation or intensive care unit admission, compared to the general population. After adjusting for other risk factors, cancer history (cancer related surgery or chemotherapy history in past month) represented the highest risk for severe events (odds ratio 5.43, $p=0.0026$). They made the first observation of this subject [10]. Several studies have shown that cancer is an independent factor that increases the risk of mortality and worsens the prognosis of SARS-CoV-2 patients [11–15]. In contrast, there were studies have indicated that cancer does not significantly increase the risk of mortality or requirement of a mechanical ventilator in age-matched groups, and the impact was found lesser than other comorbidities [16–23].

Depression is an important factor that hampers treatment compliance in cancer patients [24]. It may worsen the treatment response, increase the hospitalization rates, worsen the nutritional status and complications may increase with impaired compliance to cancer therapy [25]. Moreover, this situation can have a critical impact and lead to suicidal tendencies [26]. Ozdin et al. have shown that the prevalence of anxiety and other psychological disorders increases during pandemics [27] SARS-CoV-2-related anxiety can increase due to the absence of treatment options and vaccines and due to a feeling of uncertainty regarding when the pandemic will end [28, 29]. Recent studies have shown that the SARS-CoV-2 pandemic has increased the rate of chemotherapy

delays in cancer patients. Tele-video conferencing applications may reduce these disruptions [30].

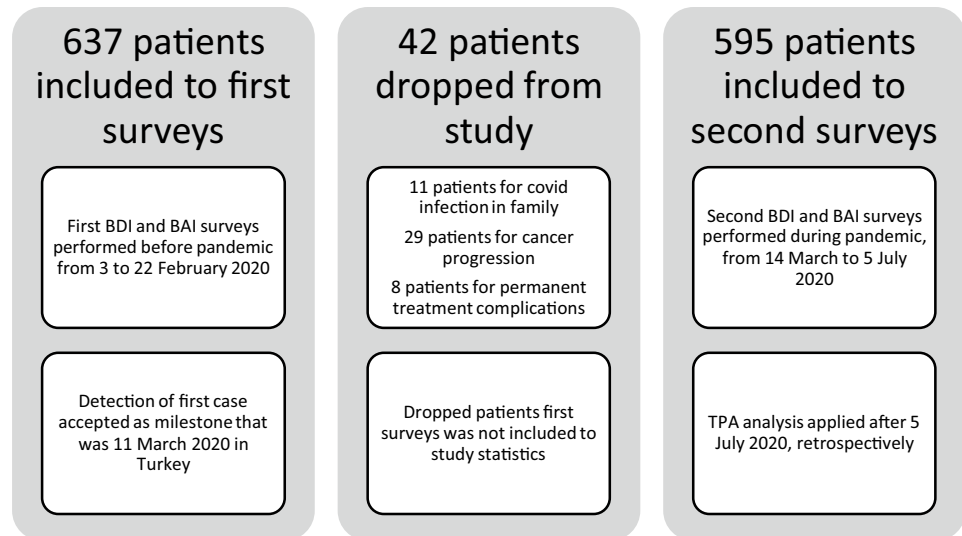
In our knowledge, no study has compared the conditions of cancer patients before and during the pandemic in terms of depression and anxiety levels and treatment delays. The primary aim of the present study was to evaluate anxiety and depression in cancer patients during the SARS-CoV-2 pandemic and perform treatment postponement analysis (TPA) in a chemotherapy unit operating in a six million population area in Diyarbakir, Turkey. Although our hospital is the largest and most equipped center in the region among the hospitals affiliated with the Ministry of Health, it also functions as a primary pandemic hospital as well as primary chemotherapy center. We had analyzed depression and anxiety in a group of patients before the pandemic. This helped us achieve the purpose of comparing the results before and during the pandemic. The secondary aim of the present study was to investigate the correlation between treatment delays and depression and anxiety levels in these patients.

Materials and methods

Overall design and patients

A total of 637 patients whom receiving active cancer treatment participated in 3 February 2020. 595 patients with breast ($n=267$), ovarian ($n=55$), colorectal ($n=190$), gastro-esophageal ($n=83$) cancer completed study in 5 July 2020. The eastern cooperative oncology group (ECOG) performance status of all the patients was 0–1. The Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) were administered before and during the SARS-CoV-2 pandemic, at a mean interval of 54 days (Fig. 1). The patients who were surveyed in the cross-sectional questionnaire evaluation before the onset of the pandemic were re-surveyed during the pandemic process. Outbreak date accepted as the first case of SARS-CoV-2 on 11th March 2020 in Turkey [5]. Pre-pandemic surveys were conducted from 3 to 22 February. The surveys which were during the pandemic period were applied from 14 March to 5 July 2020. After the last questionnaire on July 5, analysis of the delay to treatment of the patients was performed. Some patients deliberately refused to attend their appointments on time due to anxiety of becoming infected with coronavirus in the hospital. The existence of this situation was noted from the hospital records, telephone interviews or face to face meetings in their later appointments retrospectively. Treatment complications which indicate delays, such as neutropenic fever, or other external factors were not included in the TPA statistics. 101 neutropenia, 63 thrombocytopenia, 47 febrile neutropenia, 14 neutropenic diarrhea, 23 persistent vomiting, 4 gastrointestinal bleeding, 8 skin reactions, 6 hyperkalemia,

Fig. 1 Overall design. *BDI* Beck Depression Inventory, *BAI* Beck Anxiety Inventory. *TPA* treatment postponement analysis



BDI: beck depression inventory, BAI: beck anxiety inventory. TPA: treatment postponement analysis

4 hyponatremia, 4 syncope, related delays were excluded. In addition, it was questioned whether the patients came to the hospital with their own vehicle or by public transportation and responses were recorded. Age group analysis was made by dividing into decades. Mean BDI, BAI and TPA scores after outbreak were examined and compared in their groups divided into decades between 18 and 76 years of age.

Evaluation was entirely focused on treatment delays in patients due to the fear of SARS-CoV-2 transmission. Patients with poor performance scores were excluded because the expected well-being would be lower, regardless of the factors we investigated. Patients with total mastectomy before the study were excluded. 23 patients with cancer progression, eight patients with severe chemotherapy complications were dropped from study. 11 cases who were infected with SARS-CoV-2 who were receiving active treatment during the study, or with a history of SARS-CoV-2 infections in their relatives with whom they share the same house were also dropped from study, and a total of 595 patients completed both surveys and enrolled for study (Fig. 1).

Beck Depression Inventory

BDI is a 21-item self-report questionnaire that measures the symptomatology of depression [31]. It has been proven to have sufficient consistency in psychiatric and non-psychiatric populations [32]. The Turkish validation was performed by Tegin and Hisli, with each answer being scored on a scale of 0–3 [33, 34]. Higher total scores indicate more severe depressive symptoms. The standardized cut-off values are as follows: 0–9 points are considered as normal, 10–16 points are considered as mild depression, 17–29 points are considered as moderate depression, and 30–63 points are considered as severe depression.

Beck Anxiety Inventory

BAI is a self-report, multiple-choice questionnaire used to measure the severity of anxiety in children and adults. The questionnaire assesses how the previous week of the person was. It consists of 21 questions related to anxiety symptoms, such as numbness, tingling, sweating and fear. A high score indicates serious anxiety [35]. The Turkish validation was performed by Ulusoy et al. [36]. A score of 0–21 indicates low anxiety, 22–35 indicates moderate anxiety and ≥ 36 indicates severe anxiety.

Treatment postponement analysis

TPA was performed using outpatient registration records in the hospital automation system and verified with telephone or face to face interviews. The mean duration delay (days) was compared before and during the pandemic. Postponements were recorded depending on the preference of the patient, which was caused by the fear of the pandemic. Treatment delays due to side effects and other external factors were excluded.

Statistical analysis

Statistical analysis of the data was performed using SPSS software version 21 (SPSS Inc., Chicago, IL, USA). Data are presented as the mean \pm SD. Normality of the distribution of continuous variables was determined using the Kolmogorov–Smirnov test. The differences between two independent groups were compared using the independent sample t-test for normally distributed variables and the Mann–Whitney *U* test for non-normally distributed variables. The differences among three independent groups were compared

using one-way ANOVA with the Tukey post hoc test for normal distributions and the Kruskal–Wallis test with Bonferroni correction for non-normal distributions. Correlations between variables were evaluated using Pearson's or Spearman's correlation coefficients for normally and non-normally distributed variables. A p value < 0.05 was considered statistically significant. Ethical approval was received from the Gazi Yasargil Training and Research Hospital independent ethics committee, Diyarbakir, Turkey (number: 564, date 25.5.2020).

Results

A total of 595 patients [459 females, median age 54 (18–76), mean age 50.48 (± 14.89) years] completed the present study. 46 illiterate patients answered the questions with the support of a physician or their relatives. The ECOG performance status of all the patients was 0 ($n = 401$, %67.4) to 1 ($n = 194$, %32.6). BDI and BAI were administered before and during the pandemic, at a median interval of 54 (22–71) (mean: 49.44 ± 16.20) days.

All these adverse effects occurred temporarily. 595 patients who completed both surveys, did not developed progression or treatment-related permanent complications during this time period. The demographics and clinical characteristics of the patients are provided in Table 1. Both depression and anxiety levels were found to be significantly higher in females ($p = 0.000$). Moreover, treatment delays were more common in patients who had to use public transportation ($p = 0.038$). The results of other interim analyses, including marital status, education level, social support, comorbidities, ECOG status and stage of cancer, were insignificant. There was no statistically significant difference in the BDI, BAI and TPA scores of 46 illiterate patients compared with the general group. However, BDI scores increased slightly with age. Similarly, TPA scores were higher in elderly patients. The TPA scores were significantly higher in older patients (> 40 years old) than younger patients ($p = 0.021$). There were no significant differences within decade stratification results of age (Table 1).

We did not find any significant differences in the comparison based on cancer type or treatment type. The percentage distribution of cancer type and treatment modality is shown in Table 2. Delays to controls in patients who received oral therapy were numerically higher, but no statistically significant difference was observed ($p = 0.062$). An analysis was conducted to find out whether there was a significance of interval length between questionnaires. There was no statistically significant difference between patients who had short or long intervals between their questionnaires (Online Resource 1).

There were significant differences in the conditions of patients before and during the pandemic. Both BDI and BAI scores increased in the patients. Moreover, a significant difference was noted in the TPA scores (Table 3). In addition, when subgroups were examined, it was observed that the statistical significance was preserved across age groups, social features and disease stages ($p = 0.000$).

There was a significant positive correlation among the mean overall BDI, BAI and TPA scores ($p = 0.000$) (Table 4). Moreover, there was a significant positive correlation between the pre-pandemic results ($p = 0.000$).

Discussion

To our knowledge, this is one of the first studies to evaluate depression and anxiety levels in a specific patient group before and during the SARS-CoV-2 pandemic, in addition to performing TPA. In the present study, it was observed that in the period following the announcement of the first case in our country, the BDI and BAI scores of the patients increased compared to the February period and were correlated with TPA scores. The first case in our country for the pandemic was taken as a milestone. Pandemics have profound effects on the lifestyle of the entire population. In the period between March and July 2020, regular announcements regarding the number of cases and deaths were made with the daily announcements of the Ministry of Health, especially during the initial period of the pandemic in our country. Restrictive implementations in social life were made in an increasing fashion (earlier and more broadly for 65 years or elder patients) [37]. In this process, the announcements of the minister of health were carefully followed by the public. Newspapers and televisions were the primary communication tools. The vast majority of health-care services in our country are provided by state-owned hospitals, including cancer care. And the operation of hospitals during the pandemic process was primarily regulated by the ministry of health. Genereux et al. examined the psychological conditions covering a wide geographical area, and it was revealed that the psychological disorders caused by pandemic conditions are closely related with the regional case density and may differ in terms of timing within regions [38]. The treatment delay and survey data we have also support this. There are limited data regarding treatment disruptions or follow-up problems in patients with well-being disorders. Observational analysis has been performed during the initial period of the pandemic in the general population or various patient groups [39–41]. In one of Turkey's largest cancer centers, the outpatient application decreased with statistical significance. There was also a statistically significant decrease in hospitalization for elective procedures and

Table 1 Demographics, clinical characteristics and related comparison analysis

		BDI mean (SD)	BAI mean (SD)	TPA mean (SD)
Age: median (min–max)	54 (18–76)			
Mean (sd)	50.48 (± 14.89)			
18–40 <i>n</i> (%)	54 (%9.1)	20.1 (4.7)	13.7 (4.8)	9.4 (3.6)
41–76 <i>n</i> (%)	541 (%90.9)	21.6 (3.9)	12.5 (3.4)	11.7 (5.2)
<i>p</i> value		0.16	0.44	0.021
18–30	12	18.6 (3.9)	13.6 (4.4)	9.6 (4.2)
30–40	42	21.6 (4.1)	13.0 (4.0)	9.2 (3.6)
40–50	144	20.6 (4.4)	12.1 (4.2)	10.6 (4.6)
50–60	201	21.4 (4.3)	13.0 (3.9)	11.0 (4.5)
60–70	114	21.9 (4.6)	12.3 (4.3)	12.4 (4.6)
70–76	28	22.5 (4.8)	12.6 (4.6)	12.8 (4.6)
<i>p</i> value		0.54	0.47	0.33
Gender, <i>n</i> (%)	459 female (%77)	22.3 (4.2)	14.6 (4.5)	10.3 (4.6)
	136 male (%23)	19.1(4.2)	10.6 (3.3)	6.3 (3.1)
<i>p</i> value		0.000	0.000	0.000
Marital status, <i>n</i> (%)				
Married	494 (%83.0)	21.6 (4.5)	13.9 (4.6)	9.4 (4.6)
Single	101 (%17.0)	20.2 (3.9)	12.2 (3.6)	8.0 (3.5)
<i>p</i> value		0.47	0.49	0.098
Education level, <i>n</i> (%)				
Uneducated	171 (%28.7)	22.0 (4.6)	13.8 (4.6)	9.7 (4.9)
Educated	424 (%71.3)	20.6 (4.3)	13.2 (4.6)	8.8 (4.3)
<i>p</i> value		0.19	0.27	0.10
Education status, <i>n</i> (%)				
Illiterate	46 (%7.7)	21.8 (4.4)	13.2 (4.2)	9.8 (4.7)
Literate	549 (%92.3)	20.5 (4.4)	13.4 (4.4)	9.0 (4.6)
<i>p</i> value		0.26	0.38	0.21
Social support, <i>n</i> (%)				
Spouse	470 (%79.0)	21.6 (4.5)	13.8 (4.6)	9.4 (4.6)
Family	107 (%17.9)	21.5 (4.6)	13.0 (4.5)	9.4 (4.7)
Nobody	14 (%2.4)	21.9 (4.6)	13.3 (5.5)	10.0 (7.1)
<i>p</i> value		0.11	0.33	0.18
Transportation, <i>n</i> (%)				
Public	266 (%44.7)	21.7 (4.6)	13.7 (4.6)	10.7 (4.5)
Own	329 (%55.3)	21.4 (4.3)	13.5 (4.5)	9.3 (3.5)
<i>p</i> value		0.09	0.11	0.038
ECOG status, <i>n</i> (%)				
0	401 (%67.4)	20.2 (4.0)	13.1 (4.4)	9.6 (4.6)
1	194 (%32.6)	22.6 (4.7)	13.7 (4.5)	9.8 (4.7)
<i>p</i> value		0.071	0.094	0.39
Comorbidity, <i>n</i> (%)				
Hypertension	239 (%40.2)	22.0 (4.5)	13.0 (4.5)	9.4 (5.0)
2 and more comorbidity	163 (%27.4)	22.6 (4.8)	14.6 (4.6)	9.8 (5.3)
No comorbidity	193 (%32.4)	22.5 (3.7)	15.0 (4.0)	10.0 (4.7)
<i>p</i> value		0.41	0.39	0.19
Stage, <i>n</i> (%)				
Loco-regional	255 (%42.9)	21.6 (4.6)	13.6 (4.5)	9.0 (4.3)
Metastatic	340 (%57.1)	21.6 (4.4)	13.9 (4.6)	9.7 (5.0)
<i>p</i> value		0.61	0.56	0.27

All analysis of this table performed from after outbreak results

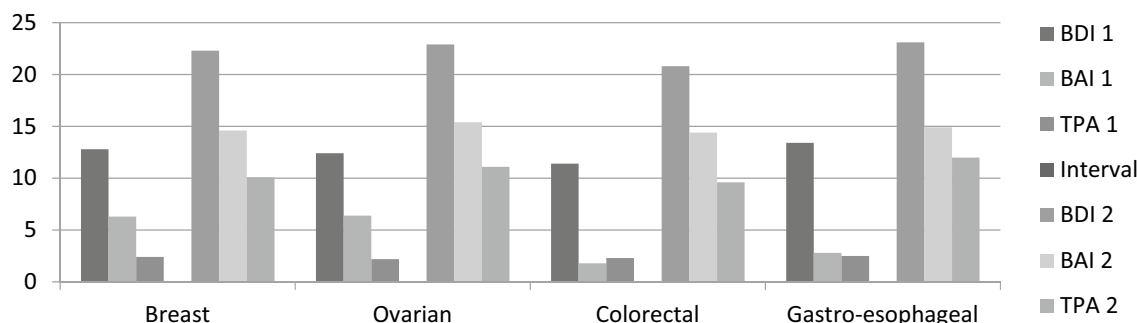
SD standard deviation, BDI Beck Depression Inventory, BAI Beck Anxiety Inventory, TPA treatment postponement analysis

Table 2 Cancer type and treatment features

Cancer, <i>n</i> (%)	Treatment, <i>n</i> (%)	
Breast	267 (%44.9)	
Ovarian	55 (%9.2)	
Colorectal	190 (%32.0)	
Gastro-esophageal	83 (%13.9)	
	Multi-drug chemotherapy	293 (%49.2)
	Single agent chemotherapy	90 (%15.1)
	Chemotherapy + targeted therapy	88 (%14.8)
	Endocrine therapy	99 (%16.6)
	Other	25 (%4.2)

There was no statistically significant result of comparison depend on cancer type or treatment type

Table 3 Results by type of cancer, before and during pandemic



	BDI score: mean (sd)	BAI score: mean (sd)	TPA days mean (sd)
Breast (n = 267)	12.8 (3.0)*–22.3 (4.0)** <i>p</i> : 0.000	6.3 (1.4)*–14.6 (4.5)** <i>p</i> : 0.000	2.4 (1.0)*–10.1(4.5)** <i>p</i> : 0.000
Ovarian (n = 55)	12.4 (2.3)*–22.9 (3.3)** <i>p</i> : 0.000	6.4 (1.1)*–15.4 (3.8)** <i>p</i> : 0.000	2.2 (1.2)*–11.1(3.8)** <i>p</i> : 0.000
Colorectal (n = 190)	11.4 (2.1)*–20.8 (3.0)** <i>p</i> : 0.000	7.4 (1.7)*–14.4 (3.6)** <i>p</i> : 0.000	2.3 (1.1)*–9.6(2.8)** <i>p</i> : 0.000
Gastro-esophageal (n = 83)	13.4 (2.7)*–23.1 (3.5)** <i>p</i> : 0.000	7.7 (1.1)*–14.9 (3.2)** <i>p</i> : 0.000	2.5 (1.7)*–12.0(4.1)** <i>p</i> : 0.000

p values was obtained by comparing the results before and after the outbreak. BDI 1, BAI 1, TPA: before pandemic, BDI 2, BAI 2, TPA 2: during pandemic

SD standard deviation, *BDI* Beck Depression Inventory, *BAI* Beck Anxiety Inventory, *TPA* treatment postponement analysis

*Before outbreak, **during pandemic

Table 4 Correlation analysis

Mean scores correlation	BAI	TPA
BDI	<i>r</i> : 0.756 <i>p</i> =0.000	<i>r</i> : 0.682 <i>p</i> =0.000
BAI		<i>r</i> : 0.810 <i>p</i> =0.000

Spearman correlation analysis

palliative support. In contrast, an increase in chemotherapy-related hospitalization was observed [42].

Previous studies have targeted different disease groups and evaluated treatment flaws associated with hospital overfilling during a pandemic in cancer clinics [43, 44]. Colombo et.al. performed a controlled evaluation of treatment delays and created dynamic guidelines that evolve according to the pandemic situation [45]. Cancer patients who receive active treatment have periodic treatment dates and any delay can be followed by the physician from the hospital records. In the present study, there were no serious changes in disease-related factors that could disrupt the general well-being of

the patients up to 6 months before administering the questionnaires. Additionally 42 patients were dropped from study between first and second survey due to the cancer progression, permanent treatment complications and SARS-COV 2 infection (infection of themselves or their in-house family members). As a result we could analyze SARS-COV 2 associated concerns that affects active treatment participation.

In our study, higher depression and anxiety levels were observed in female patients, in accordance with the findings of many previous studies [46–48]. This may be associated with the disadvantage of females in terms of social support and economic freedom or with the fact that females bear more burden in terms of raising children and having household responsibilities. The population of the present study was female-weighted (77% females). Similarly, Özdin et al. found higher pandemic-related anxiety in females [27].

The TPA scores significantly differed between patients younger and older than 40 years of age. Elderly patients preferred to postpone their appointments for a while and stay home. This may be related to the information that the elderly population is at a much higher risk of SARS-CoV-2 infection, in addition to the age-related precautions and warnings by the government or the younger patient group may be in a more reckless mood. Hongyu et al. showed that anxiety and mental disorders are more intense in regions where government measures and quarantine practices are stringent [49]. Lal et al. also found that in the elderly population, psychological problems caused by the pandemic are increasing [50]. It was observed that the situation was more likely related with lockdowns and school closures in younger patients. And social media is a major impact for young population's behavior [51].

The high TPA scores in patients who had to use public transportation is an expected result for patients who would be exposed to such environments with a high risk of transmission. The main reason why people use public transportation in our country is that they mostly do not have the economic means to own a personal vehicle. It may be beneficial for the state or health system to intervene and ensure safe transportation to the hospital for specific patient groups, such as cancer patients. Shinan et al. found that the contact of breast cancer patients with their physicians decreased during the pandemic and that the rate of cancellation of appointments was higher in hematology and oncology clinics. They stated that appointment cancellations increased with the education level and the presence of additional chronic diseases [52].

We did not find any significant differences in the comparison depending on cancer type or treatment type, except that patients who received oral therapies, had postponed more appointments numerically. This may be due to the patients' ability to continue treatment at home and the relative side effects being less severe than those of cytotoxic

chemotherapy. The remote management of oral treatments is relatively easy; however, the disruption of intravenous chemotherapies results in a risk of disease progression.

There was no statistically significant difference in terms of depression, anxiety and TPA progression between the patients with short and long intervals in the analysis of interval length between the questionnaires. This situation supports the view that fears about the pandemic emerged strongly in the time period between when the first case was announced and the early stage of pandemic. This situation was also exacerbated by the press behavior and serious social restrictions imposed by government [37].

A strong positive correlation was observed between BDI, BAI and TPA scores. Progression of depression and anxiety may be associated with deliberate delays of appointments. The management of elective surgery and adjuvant chemotherapy in low-risk patient groups during the pandemic has been the subject of extensive discussion. In the literature, there are approaches advocating that treatments can be postponed in controlled, low-risk groups [53]. The controlled appointment delays by the physician will continue to be a separate topic of discussion; however, in the present study, we focused on the patients' preference to postpone appointments because of the fear of SARS-CoV-2 transmission. In this context, the strong positive correlation of BAI scores with BDI and TPA scores open a door to healthcare professionals for the pre-detection of patients who can escape treatment.

Many institutions are allocating staff and resources to cope with the burden generated by COVID-19, and routine controls of patients with cancer are being postponed. However, in patients under treatment, continuum of care in the safest settings possible should be the priority. So, the oncology clinics, including our clinic, undertook multiple isolation and hygiene measures, and adaptations in the workplace for maintaining the care of patients in the safest environment possible [54].

Limitations of our study: since it is an experience of a single center, a single geographical region has been evaluated. More comprehensive data can be obtained by collective evaluation of multiple centers. Cities with different socio-economical and health care opportunities could represent different results. In addition, if an evaluation with a larger number of patients in a single cancer type is made, more specific results can be achieved. In our study, patients who received different treatments for many cancer types were evaluated collectively. Although we do not find a significant difference in the stratification we made regarding risk groups such as cancer stage, further studies addressing these subgroups separately are required.

In conclusion, the depression and anxiety levels in cancer patients who receive active treatment have progressed in the pandemic. Female patients and elderly patients have higher

anxiety and depression. The obligation to use public transportation is a major handicap for patients, resulting in treatment disruption. Communication between physicians and patients should be strong, and the situation should be managed professionally. At this point, if necessary, assistance should be obtained from psychiatric and public health experts.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11136-021-02795-4>.

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Author contributions OAY, KP and EE developed the concept and designed research; OAY performed research and acquired data; OAY analyzed data; OAY, KP and EE interpreted data; OAY, KP and EE wrote and reviewed the manuscript.

Data availability Data are available at the Department of Medical Oncology, Gazi Yasargil Treatment and Research Hospital, Diyarbakir Turkey. Patients did not approve a public data deposition.

Code availability The code can be obtained upon a request to the first author of this paper.

Compliance with ethical standards

Conflict of interest We have read and understood Quality of Life Research's policy on disclosing conflicts of interest and declare that we have none.

Ethical approval Ethical approval was received from the Gazi Yasargil Training and Research Hospital committee, Diyarbakir, Turkey (number: 518, date 24.2.2020).

Consent to participate All patients have signed a written consent for treatment and data analysis. The treatment has not been changed by the design of this study.

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