The psychological impact of the covid-19 pandemic on radiotherapy cancer patients

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ABSTRACT

In March 2020, the World Health Organization (WHO) characterized the outbreak of the coronavirus disease 2019 (COVID-19) as a pandemic. The aim of this study was to evaluate the psychological impact of the COVID-19 pandemic on cancer patients undergoing radiotherapy.

Were enrolled 210 patients in treatment and in follow-up who had access to the Radiation Oncology Department of the Campus Bio-Medico University Hospital Foundation between April and May 2020. The sample was subjected to structured interview and validated questionnaires. 37% of patients showed significant levels of distress; depressive symptoms were reported by 22.4% of patients and 99% of sample had clinically significant anxiety symptoms. All patients anxiety worsened during the COVID-19 pandemic ($p=< 0.001$). Patients on active treatment had higher levels of distress (3.5 vs 2.6; $p = 0.04$) and anxiety (3.5 vs 2.6; $p = 0.04$). Lung cancer patients appeared to be more afraid of COVID-19 than other patients (24.2 vs 22.2). This study highlights the presence of clinically significant anxiety in 99% of sample. This conclusion reflects the condition of emotional distress present during the pandemic which makes it necessary to treat patients in a multidisciplinary perspective that includes psychological support in the care plan.

Introduction

Since December 2019, countries worldwide are experiencing an outbreak of a novel beta-coronavirus known as severe acute respiratory syndrome corona virus 2 (SARSCoV-2). In March 2020, WHO declared the 2019 novel coronavirus disease (COVID-19) caused by SARS-CoV-2 a public health emergency of international concern [1]

Consequently, the outbreak of 2019-nCoV has caused public panic and mental health stress. A study based on 1210 patients in China has shown that more than half of the respondents rated the psychological impact of this health emergency as moderate-to-severe, and about one-third reported moderate-to-severe anxiety [2]. A recent meta-analysis of studies investigating the prevalence of the psychological impact of COVID-19 on the general population reported the prevalence of stress at 29.6% (95% confidence limit: 24.3–35.4), the prevalence of anxiety at 31.9% (95% confidence interval: 27.5–36.7), and the prevalence of depression at 33.7% (95% confidence interval: 27.5–40.6) [3].

Compared with the general population, cancer patients are at increased risk of persistent depressive and anxiety disorders and symptoms. These conditions may appear as a reaction to the diagnosis itself and/or throughout the treatment and rehabilitation processes due to the different types of loss and different levels of stress and emotional distress experienced by patients [4]. Moreover, since the COVID-19 outbreak, these patients are further concerned about the risk of severe complications related to a possible SARS-CoV-2 infection due to their immunosuppressive state. The prior-pandemic literature indicates that cancer patients reported psychological disorders such as depression in 20–30% of cases and anxiety in 25–40% [5]. A systematic review on prevalence of psychosocial function decline before, during and after radiotherapy showed that anxiety levels dropped following completion of RT, whereas depression levels remained stable [6].

Recent reports on psychological symptoms in oncological patients during the COVID-19 pandemic reported depression rates ranging from 10 to 30% and anxiety rates from 10 to 40% [7–9] although these reports usually refer to patients undergoing systemic treatments. Less is known about the impact of the COVID-19 pandemic on the

psychological state of cancer patients undergoing radiotherapy, with or without chemotherapy. Radiotherapy treatment represents a unique scenario for cancer treatment as the treatment is daily and can last several weeks. Patients are exposed every day to several caregivers such as radiation therapy technicians, nurses, physicians and other fellow patients who can be asymptomatic carriers of the disease. This may lead these patients to experience higher levels of stress if they perceive themselves to be at increased risk of contracting the infection.

In this setting, addressing the psychological impact of this health emergency can be of particular importance in order to adopt preventive and supportive strategies in Radiation Oncology Departments.

Materials and methods

Participants and procedure

For this prospective cross-sectional study, the sample was composed of all consecutive patients in treatment (radiotherapy with or without chemotherapy) or in follow-up who had access to the Radiation Oncology Department of the Campus Bio-Medico University Hospital Foundation during the research period (April-May 2020). 210 patient were enrolled; illiterate or low health literacy patients were excluded from the study. The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Ethical Committee of the Campus Bio-Medico University. Informed consent was obtained from all participants.

Measures

The current study involved a structured interview specifically formated to analyze the impact of the COVID-19 pandemic on patients' mental health and with the use of validated questionnaires for distress, depression and anxiety. All questionnaires were self-compiled.

The structured interview included questions pertaining to the patients' sociodemographic information and clinical characteristics of the treatment being followed, such as type of primary tumor, active therapy (palliative or radical purpose) or follow-up, age, sex, education, working status and living conditions. Moreover, the questionnaire also included questions related to their knowledge and concerns about COVID-19, potential virus exposure in the last 14 days, fear of contracting the virus, and discomfort and/or loneliness experienced due to isolation caused by the restrictions in force.

To assess the psychological functioning (depression and anxiety) and resilience skills, the following validated questionnaires were used:

1) Connor-Davidson Resilience Scale: a self-assessment questionnaire that investigates the following five factors of resilience: personal competence and tenacity; self-confidence and management of negative emotions; positive acceptance of change and secure relationships; the ability to maintain self-control; and spiritual influences. The tool consists of 25 items that are ranked on a Likert scale from 0 to 4 points, from "Not true at all" to "True nearly all the time" [10]
2) Beck Depression Inventory-II: a self-assessment questionnaire consisting of 21 items evaluating the severity of depression. According to the global score, the degrees of depression range from normal or minimal (0–13), to mild (14–19), to moderate (20–28), and severe (29–63) [11].
3) State-Trait Anxiety Inventory: a self-assessment questionnaire aimed to quantify anxiety. It includes 40 questions and separately evaluates trait anxiety (a longstanding condition) and state anxiety (a temporary condition). A score of 39 to 40 on each subset suggests clinically significant anxiety [12]. In this case state anxiety evaluated the anxiety related to the temporary condition of pandemic while trait anxiety referred to pre-existing anxiety.

4) Distress Thermometer (DT): is a tool by which a patient can self-measure the level of perceived psychic suffering through a scale from "0" (no emotional distress) to "10" (maximum emotional distress) [13]

Data analysis

Continuous variables were expressed as the mean ± standard deviation (SD), while categorical variables were expressed as frequency and percentage. The Mann-Whitney or Student's t-test, Chi-square and Fisher's exact tests were used to compare continuous and categorical variables. Pearson's correlation analysis was performed to determine correlations and relationships between the results of the COVID-19 specific interview and domains of psychological status determined by questionnaires. In light of the symptoms of the COVID-19 infection, a specific analysis was conducted on patients with lung cancer in comparison with other primary tumors. The significance level was set at $p < 0.05$. Statistical analysis was performed using SPSS version 24.

Results

Baseline characteristics

Overall, 210 patients agreed to participate in the study and 208 completed the survey (99.0% response rate). Median age was 65 years (range 20–92). Most patients were female (60%). Seventy-four patients (35.6%) were employed and 43 patients (20.8%) had graduated. The married patients or those living in common-law relationships made up 65.4% of the sample, while 12% was single, 12% was divorced and 10,6,8% was widowed.

In relation to the cancer type, 33.6% of the sample was affected by breast cancer, 17.7% had a lung diagnosis, 13.5% prostate, 14% colorectal, 7% head and neck and 14.2% of patients were affected by other oncological pathologies. Most of the patients (79.3%) were in active radiotherapy treatment and 20.7% in follow up. Among the patients in treatment, 70 patients (42.7%) received palliative treatment and 94 (57.3%) curative treatment. Tables 1 summarizes the sociodemographic and clinical characteristics of the sample.

Psychological impact of Covid-19: analysis of questionnaires

Table 2 sets out the questionnaire scores of the whole population

Table 1
Patients' socio-demographic and clinical characteristics.

Baseline Characteristic	N°	%
Sex		
Male	83	39.9
Female	125	60.1
Level of education		
Primary education	16	7.7
Low secondary school	62	30.0
High secondary school	86	41.5
University	43	20.8
Employment status		
Employed	74	35.6
Unemployed	14	6.7
Housewives	19	9.1
Retired	101	48.6
Marital status		
Single	25	12.0
Married	136	65.4
Separated/divorced/widowed	47	22.6
Treatment		
Active (Radioterapy +/- Chemotherapy)	165	79.3
Follow-up	43	20.7
Primary tumor		
Lung	39	18.9
Other malignancies	167	81.1

Table 2
Differences in questionnaires scores among patients.

Measure	Covid-19 fearMean (SD)	p	Covid-19 impact on mental health (Mean(SD)	p	Beck Depression Inventory-II(BDI-II)Mean(SD)	p	State--Trait Anxiety InventorySTAI-YMean(SD)	p	State--Trait Anxiety InventoryTRAIT-YMean(SD)	p	Distress ThermometerMean (SD)	p	Connor-Davidson Resilience Scale (CD-RISC-25)Mean (SD)	p
All patients	22.6 (6.4)		14.3 (5.9)		8.2 (7.7)		38.68 (10.0)		36.6 (9.7)		3.3 (2.6)		66.85 (18.0)	
Sex		.76		.40		.72		.44		.35		.32		.31
Male	22.4 (6.7)		13.9 (5.4)		7.9 (7.3)		38.0 (9.5)		35.8 (10.1)		3.6 (2.6)		68.4 (18.8)	
Female	22.7 (6.2)		14.6 (6.2)		8.3 (7.9)		39.1 (10.3)		37.0 (9.4)		3.2 (2.6)		65.8 (17.2)	
Level of education	22.5 (6.7)	.83	13.9 (5.5)	.47	7.6 (7.3)	.34	38.9 (10.5)	.82	35.9 (8.7)	.51	3.2 (2.8)	.41	69.3 (16.1)	.42
Primary education+	22.6 (6.2)		14.6 (6.1)		8.6 (7.9)		38.5 (9.7)		36.9 (10.4)		3.5 (2.6)		65.28 (18.8)	
Low secondary school														
High secondary school+ University														
Employment status	22.6 (6.7)	.93	14.5 (6.3)	.69	8.4 (8.7)	.61	38.4 (9.7)	.79	37.5 (8.6)	.30	3.5 (2.7)	.60	66.0 (17.3)	.59
Employed	22.5 (5.8)		14.2 (5.6)		7.8 (5.6)		38.8 (10.2)		36.0 (10.3)		3.3 (2.6)		67.3 (18.3)	
Unemployed/ Housewives/Retired														
Marital status		.97		.63		.17		.17		.46		.76		.62
Married	22.6 (6.7)		14.2 (6.1)		8.7 (8.6)		39.4 (10.0)		36.9 (10.2)		3.4 (2.6)		66.39 (18.3)	
Not married	22.5 (5.7)		14.6 (5.5)		7.2 (5.6)		37.4 (10.0)		35.9 (10.2)		3.3 (2.8)		67.7 (17.1)	
Treatment		.050		.91		.53		.78		.27		.04		.58
Active (Radioterapy +/- Chemotherapy)	23.0 (6.2)		14.3 (5.4)		8.4 (7.5)		38.7 (9.9)		36.9 (10.1)		3.5		66.5 (18.3)	
Follow-up	20.9 (7.0)		14.4 (7.5)		7.5 (8.3)		38.3 (10.3)		35.1 (8.1)		2.6 (2.2)		68.2 (16.1)	
Primary tumor	24.2 (6.2)	.08	14.3 (5.8)	.845	8.3 (7.1)	.740	38.5 (10.9)	.845	35.0 (9.6)	.428	3.6 (2.9)	.270	16.5 (2.6)	.422
Lung	22.1 (6.4)		14.1 (6.4)		8.1 (7.8)		38.7 (9.8)		36.9 (9.7)		3.2 (2.8)		18.2 (1.4)	
Other malignancies														

being analyzed, and among different patient groups.

Overall, 37% of patients showed significant levels of distress (total score > 5).

Clinically significant depressive symptoms were reported by 22.4% of patients, divided into mild and moderate depression (18%) and severe depression (3.4%). Ninety-nine percent of patients interviewed had clinically significant anxiety symptoms, both state and trait. In all patients anxiety worsened during the COVID-19 pandemic ($p = < 0.001$) as state anxiety resulted higher compared to trait anxiety. Eighty percent of the interviewed sample were perceived to be resilient. Furthermore, patients on active treatment had higher levels of distress (3.5 *vs* 2.6; $p = 0.04$) and anxiety (3.5 *vs* 2.6; $p = 0.04$), compared to patients in follow up. On the contrary, the type of active treatments (for example if the purpose is radical or palliative, if the therapy is only radiotherapy or radio-chemotherapy) did not affect the results obtained. Considering the disease site, the data obtained shows that lung cancer patients are more afraid of COVID-19 than other patients (24.2 *vs* 22.2), even if they did not reach a significant statistical difference ($p = 0. 08$).

Table 3 shows all the correlations between COVID-19 related items investigated by the structured interviews and the scores derived from the validated questionnaires for depression, anxiety and distress.

Concern for COVID-19 was significantly correlated with distress, depression and state anxiety ($p < 0.001$). In addition, there is a strong correlation between depression and both state and trait anxiety (*Pearson correlation*= *0.668* and *0.723* respectively) and between distress and state anxiety (*Pearson correlation=0.597*).

Resilience was inversely correlated with all other parameters; the strongest correlation was observed with trait anxiety ($p = -684$). Finally, 29.8% of patients required psychological counseling.

Discussion

This prospective research documents the psychological impact of COVID-19 on a large sample of patients suffering from oncological pathology who carry out active cancer therapy or are in the follow-up phase in a radiotherapy department. The results of the questionnaires (validated and specifically customized for COVID pandemic) show that although the majority of the sample have good resilience levels, more than a third show clinically significant distress symptoms, and 22% of patients have depressive symptoms.

These results appear to be consistent with the literature data concerning the population of cancer patients recorded in the period preceding the pandemic, which highlights the condition of psychological fragility reactive to a disease condition that impacts the patient as a whole [14].

In relation to the period marked by the spread of Covid-19, the number of studies that have detected and compared levels of anxiety and depression in cancer patients before and during the pandemic is restricted and has mixed results.

Some literature data reveal no significant differences between the pre and post Covid period. According to the authors, the pandemic does not seem to have a negative impact on anxiety and depression levels in cancer patients. [15–17]. In contrast, other research documents reported increased levels of anxiety and depression during pandemic [18,19].

These differences may be motivated by the traumatic impact of cancer disease on a person's global functioning independent of external and environmental factors, by cultural differences that influence the results of scientific research in different countries, and by the socio-demographic characteristics of respondents

Table 3
Correlations between COVID related structured interview and validated questionnaires.

		Covid-19 fear	Covid-19 impact on mental health	Beck Depression Inventory-II (BDI-II)	Distress Thermometer	State--Trait Anxiety InventorySTAI-Y	State--Trait Anxiety InventoryTRAIT-Y	Connor-Davidson Resilience Scale (CD-RISC-25)
Covid-19 fear	Pearson Correlation	1	.603**	.384**	.540**	.541**	.397**	−0.213**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.002
	N	206	206	206	206	206	206	205
Covid-19 impact on mental health	Pearson Correlation	.603**	1	.486**	.553**	.576**	.454**	−0.318**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	206	206	206	206	206	206	205
Beck Depression Inventory-II (BDI-II)	Pearson Correlation	.384**	.486**	1	.460**	.668**	.723**	−0.480**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	206	206	206	206	206	206	205
Distress Thermometer	Pearson Correlation	.540**	.553**	.460**	1	.597**	.468**	−0.336**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	206	206	206	206	206	206	205
State--Anxiety Inventory STAI-Y	Pearson Correlation	.541**	.576**	.668**	.597**	1	.735**	−0.475**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	206	206	206	206	206	206	205
-Trait Anxiety Inventory TRAIT-Y	Pearson Correlation	.397**	.454**	.723**	.468**	.735**	1	−0.684**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	206	206	206	206	206	206	205
Connor-Davidson Resilience Scale (CD-RISC-25)	Pearson Correlation	−0.213**	−0.318**	−0.480**	−0.336**	−0.475**	−0.684**	1
	Sig. (2-tailed)	.002	.000	.000	.000	.000	.000	
	N	205	205	205	205	205	205	205

** Correlation is significant at the 0.01 level (2-tailed).

The data achieved in our research show the presence of clinically significant anxiety on almost all of the sample considered (99%). This result appears significantly higher than that reported in the literature, both with reference to the studies conducted on cancer patients in the period prior to the outbreak of the pandemic, and in the general population during COVID-19 [2,3].

Therefore, we hypothesize that the presence of high levels of anxiety reflects the condition of emotional distress reactive to the outbreak of the pandemic. Other experiences show that, like cancer patients, medical personnel in the Department of Radiotherapy also develop psychopathological symptoms during the COVID-19 epidemic with particular reference to an increase in sleep disturbances [20,21].

Furthermore, considering specifically the anxious symptomatology studied, the data obtained shows a high percentage of both types of patients: those who in general have a constant tendency to face every life situation with excessive anxiety; and those who react specifically to contingent circumstances/stimuli with significant anxiety.

In line with the initial hypotheses, there is a significant positive relationship between the presence of state anxiety and concern for COVID-19, depression and distress symptoms.

This data appears particularly significant since state anxiety expresses a subjective feeling of tension and concern, relating to a stimulating situation and appears linked to the circumstances. Therefore, it is possible to hypothesize that the health and social emergency in reaction to COVID-19 represents an additional source of emotional distress that can add to the psychological suffering caused by the oncological disease by increasing, in particular, the levels of anxiety.

We believe that this increase is due to multiple factors related to the difficulty of adapting to the new condition: the need to maintain social distancing and to carry out frequent hand washing, changes in lifestyle and daily habits and the fear of contagion, which can stimulate the use of psychological control and alert mechanisms.

Our hypothesis seems in line with recent research showing a strong increase in the experience of isolation and a reduction in emotional functioning and overall quality of life during COVID-19 in cancer patients [22].

The data also shows that patients on active treatment are more worried about the fear of contagion from COVID-19, more anxious and have greater levels of distress than the follow-up population. There is a condition of greater psychological fragility perceived among those who are included in a treatment path that inevitably provides organic side effects, making the body weaker and feeding the personal condition of generalized fragility. This is especially true in patients undergoing radiotherapy treatment because this requires daily access to hospital facilities for several consecutive days, sometimes even for a period of 20–30 days. These results are confirmed by some literature data showing an increase in mood disorders in patients undergoing radiation therapy during Covid 19 [23].

For this reason, many European and American recommendations have pointed out that, in selected clinical situations, it is preferable to reduce to a maximum time the patient time spent in the hospital and choose shorter fractions in order to reduce the risk of exposure [24,25].

In this regard, it is also important to note that approximately 60% of patients with planned follow-up visits at our institution during the reference period did not show up for their appointments for fear of contracting COVID-19 in the hospital. Consequently, the patients who effectively participated in the study in the group of follow-up patients demonstrated to be more motivated in continuing with their follow-up evaluation and thereby self-selected themselves from the total group of patients as being less distressed regarding their fragile condition.

Despite Covid-19, many cancer patients express anxieties related to fear of disease progression due to delays or changes in care related to the pandemic period and wish to continue their treatment as planned despite the associated risks [26]. Another outcome of the study which is in line with our expectations, is the significant levels of distress among lung cancer patients. We assume that in these patients the fear of contracting COVID-19 represents an additional source of anguish to their sense of precarious existence and the angst of death caused by the oncological disease. In fact, we envisage that these patients are more concerned about the possibility of contagion because of the effects of COVID-19 on the respiratory system which can cause possible intubation and/or death from respiratory failure. Moreover, even if literature data regarding higher mortality in lung cancer patients are conflicting, lung cancer patients seem to be at higher risk of developing COVID-19 and at higher risk of hospitalization for COVID disease [27,28].

Conclusions

The COVID-19 pandemic represents a disturbing factor that strongly impacts psychological health and lifestyle habits and requires a new and complex adaptation. In this sense, it is necessary to treat patients in a multidisciplinary perspective that includes psychological support in the care path aimed at accommodating the fears and anxieties of patients and improving the ability to self-regulate the patient's emotional states as a means of managing intense emotions.

It is therefore necessary to further promote the patient's resilience resources so as to enhance his or her personal capacity to cope with traumatic events and to positively reorganize one's life.

CRediT authorship contribution statement

Flavia Vicinanza: Investigation, Data curation, Writing – original draft. **Edy Ippolito:** Investigation, Data curation, Writing – original draft. **Antonella Sisto:** Investigation, Data curation, Writing – original draft. **Bianca Santo:** Investigation, Data curation. **Michele Fiore:** Investigation, Data curation. **Luca Eolo Trodella:** Investigation, Data curation. **Sonia Silipigni:** . **Livia Quintiliani:** Conceptualization, Methodology, Supervision. **Sara Ramella:** Conceptualization, Methodology, Supervision.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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