Increased Levels of Anxiety, Depression, and Secondary Trauma in Radiation Oncologists during COVID-19 Pandemic: A Preliminary Report from Turkey

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OBJECTIVE
We surveyed the anxiety, depression, and secondary trauma levels of Turkish Radiation Oncologists related with COVID pandemics.

METHODS
An anonymous online questionnaire survey was created to evaluate levels of depression, anxiety, and secondary trauma among Turkish Radiation Oncologists. The survey included demographics and occupational status, Secondary Traumatic Stress Scale (STSSS), The Beck Depression Inventory (BDI), The Beck Anxiety Inventory (BAI), and State-Trait Anxiety Inventory (STAI).

RESULTS
Seventy-two respondents provided the power of about 91.4% for the significance level of 0.05. The variance homogeneity was checked by the Levene test, the effect of COVID-19 on psychology is higher in the group of >19 (9.02±0.820), as well as the effect of social isolation (8.02±1.622), the STSS scores (34.28±9.062), the STAIS scores (60.46±5.296), the STAIT scores (82.21±9.298), the BDI scores (22.68±2.788), and the BAI scores (21.04±9.321). The multiple regressions to estimate BDI revealed statistically significant effects in STAIS, BAI, and STAIT. There is a significant correlation between STSS, STAIS, STAIT, BDI, BAI, the effect of COVID-19 on psychology, and the effect of social isolation.

CONCLUSION
We have established one of the first studies demonstrating the effects of COVID-19 pandemic on depression, anxiety levels, and secondary trauma on a special physician population, the Radiation Oncologists, who specifically do not directly take part in COVID19 management.

Keywords: Anxiety; depression; radiation oncology; secondary trauma.

Introduction
The 2019 coronavirus disease (COVID-19) epidemic that began in China spread among the world rapidly. [1] The first COVID-19 case in Turkey was detected on March 11, 2020. By May 25, 2020, the total number of COVID-19 cases increased to 157814, and the total number of deaths was 4369.[2] The WHO announced
Cancer patients are considered as a high-risk group for COVID-19 pandemic, both in terms of being easily infected and having a severe infection due to immuno-suppression caused by cancer and related treatments. Regarding their comorbid conditions, they tend to need intensive care unit when they are infected with COVID-19. Because of this sensitivity, guidelines were published immediately due to the necessity of revision in clinical behavior by considering the benefit and risks in the approaches to the oncology patients during the pandemic. As with all health-care professionals, these changes forced radiation oncologists to restructure their clinical work in terms of safety and effectiveness. In this scenario, we thought that radiation oncologists could have both clinical and psychological consequences.

In terms of the fact that; whose patients were regarded as a high risk in terms of COVID-19 infection and because the COVID-19 virus blocks access to immediate cancer treatments has brought the necessity of radiation oncologists to deal with double problems. Although there have been numerous studies which investigated the psychological status of the health care professionals, there is not any study which investigated several psychological impacts of COVID-19 pandemic on radiation oncologists.

In the present study, we aimed to investigate the anxiety, depression, and secondary trauma levels of radiation oncologists.

Materials and Methods

Participants
An anonymous survey was created to evaluate levels of depression, anxiety, and secondary trauma among Turkish Radiation Oncologists. An online questionnaire (www.SurveyMonkey.com) link including occupational and demographic data and scales were used in present study. Totally, 72 Radiation Oncologists who are members of Turkish Society for Radiation Oncology filled the survey which was delivered on April 4th, 2020. The survey was estimated to take approximately 20 min to complete.

Preliminary Data on the Participants
We questioned participants’ demographics and occupational status. Five additional questions were also presented to participants to answer (Appendix).

Scales
Secondary traumatic stress scale (STSSS)
STSSS measured the STSS symptoms. STSSS is 17 items. It measures the frequency of STSS symptoms within 17 items. Accordingly, score <28 indicates little or no STSS; 28–37 indicates mild STSS; 38-43 indicates moderate STSS; 44-48 indicates high STSS, and ≥49 indicates severe STSS. The STSSS was reported to be valid and reliable in the Turkish language.

The beck depression inventory (BDI)
BDI is created by Beck et al., is a self-administered questionnaire consisting of 21 multiple-choice questions. It is one of the most commonly used instruments to measure the severity of depression. The global score is an arithmetic summation of the ratings across all 21 symptoms and ranges from 0 to 63. A higher global score indicates a higher anxiety level. BDI was reported to be valid and reliable in the Turkish language.

The beck anxiety inventory (BAI)
The BAI contains 21 items that assess the severity of clinical anxiety symptoms experienced by patients in the past month. Patients will rate each symptom on a four-point Likert scale in increasing severity, from 0 (not at all) to 3 (severe). The global score is an arithmetic summation of the ratings across all 21 symptoms and ranges from 0 to 63. A higher global score indicates a higher anxiety level. BAI was validated in the Turkish language.

State-trait anxiety inventory (STAI)
The STAI, which was developed by Spielberger, is a self-report scale consisting of two sub-scales that measure state and trait anxiety (STAIS and STAIT, respectively, in this work), for which scores of 20-60 can be derived. High scores indicate considerable levels of state or trait anxiety.

Statistical Analysis
Statistical analyses were done by G*Power version 3.1 and SPSS version 23.0. For the descriptive statistics, the central tendencies and distributions of the variables are given. According to the cut-off points of BDI, another
variable was defined. This variable has two groups. One of them is ≤19 and the other one is >19. For the comparison of mean, The normality assumption of parametric tests was checked with the Shapiro-Wilk test according to the BDI groups. When the assumption was satisfied, two-independent sample t-test was used to compare two groups. In non-parametric tests,  

Chi-square analysis was used to look for the difference between categorical variables. Depend on the normality assumption for correlation analysis; Pearson's coefficient of correlation was used. Step-wise multiple regressions were used to determine which potential dependent variables that affect the independent variables. This is the technique that also the elimination of the non-significant dependent variables. All of the assumptions of the regression were checked: The linear relationship between the independent and dependent variables, the mean of residuals is zero, normality of residuals, no multicollinearity, no autocorrelation of residuals and homoscedasticity of residuals or equal variance. 0.01 and 0.05 as a level of error probabilities (p-value) were used.

**Results**

In the power analysis, correlation analysis results were used. When the total sample size is 68, the achievement of the power is 86.5% to detect an effect size of 0.3 with a significance level (alpha) of 0.05. In the study, 72 total sample size was determined, and the power is about (symbol) 91.4% for the significance level of 0.05.

Descriptive data are shown in Table 1. The variance homogeneity was also checked by the Levene test, and it has seen that the assumption also met. When the ≤19 and >19 groups were compared, age, the effect of COVID-19 on psychology, the effect of social isolation, STSS, STAIS, STAIT, BDI, and BAI scores were statistically significant. The effect of COVID-19 on psychology is higher in the group of >19 (9.02±0.820). The effect of social isolation is higher in the group of >19 (8.02±1.622). The STSS scores are higher in the group of >19 (34.28±9.062). The STAIS scores are higher in the group of >19 (60.46±5.296). The STAIT scores are higher in the group of >19 (82.21±9.298). The BDI scores are higher in the group of >19 (22.68±2.788). The BAI scores are higher in the group of >19 (21.04±9.321) (Table 2).

The correlation between STSS, STAIS, STAIT, BDI, and BAI, the effect of COVID-19 on psychology and the effect of social isolation is shown in Table 3. Overall, the effect of social isolation—the effect of COVID-19 on psychology, STAIS—the effect of COVID-19 on psychology, the effect of COVID-19 on psychology-BDI, the effect of COVID-19 on psychology-BAI, the effect of social isolation-STAIS, the effect of social isolation-BDI, and the effect of social isolation-BAI, STAIS-BAI, and BDI-BAI have significant correlations (p<0.01). The correlations are positive and between 0.431 and 0.819. On the other hand, there are no negative correlations (Table 3).

In the multiple regressions are tried to estimate BDI in Table 4 using the step-wise technique. According to Table 3, in model 1 explains approximately 67.1% of the

| Table 1 | Descriptive statistics |
|---------|------------------------|
| n=72    |                        |
| Gender  | Male       | 17 | 24.3 | 2.0 | 1 |
|         | Female     | 55 | 75.7 |    |   |
| Age     | 41.37      |    |      | 8.899 | 33 |
| Working in Pandemic service or outpatient clinics? | Yes | 17 | 24.3 | 2.0 | 1 |
|         | No         | 55 | 75.7 |    |   |
| The effect of COVID-19 on psychology | 7.23 | 8.0 | 2.268 | 9 |
| The effect of social isolation | 6.66 | 7.0 | 2.500 | 9 |
| STSS    | 32.91      |    |      | 8.813 | 35 |
| STAIS   | 50.67      |    |      | 11.701 | 49 |
| STAIT   | 80.02      |    | 83.0 | 12.656 | 52 |
| BAI     | 13.39      |    | 11.0 | 9.992 | 34 |
| BDI     | 13.41      |    | 15.0 | 8.607 | 26 |
| BDI-groups | Cut-off point≥19 | 47 | 65.3 | 1.00 | 1.00 |
|         | Cut-off point>19 | 25 | 34.7 |    |   |

STSS: Secondary traumatic stress scale; STAIS: State-trait anxiety inventory-state; STAIT: State-trait anxiety inventory-trait; BAI: Beck anxiety inventory; BDI: Beck depression inventory
of the most affected countries by COVID-19 pandemics, and we have questioned radiation oncologists who are already working in a revealed unfortunate increase percentage of depression among radiation oncologists compared with the normal population. Moreover, the depression group had significantly higher scores in terms of anxiety and secondary trauma. Thus, it is inevitable to expose the negative consequences of this pandemic in Turkey as well as other countries of the world.

There have been numerous studies investigating the psychological consequences of COVID-19 pandemics on health workers.[5-9] In a recent meta-analysis which conducted the psychosocial effects of pandemics on healthcare workers showed that being younger, being more junior, being the parents of dependent children, or having an infected family member, longer quarantines in STAIS. STAIS is significant at a 1% significance level in model 1. BDI has a positive (0.603) relationship between STAIS. It was found that this relationship was statistically significant (t=17.015, p<0.01). The step-wise technique also gives more than one model; according to the data, this technique offers three models. The last and Model 3 explains approximately 71.1% of the change in STAIS, BAI, and STAIT. STAIS, BAI, and STAIT are statistically significant effects on BDI (Table 4).

Discussion

The whole world is affected by the COVID-19 pandemic in terms of health, economical, social and psychological manners, and prevention of the disease and the mortality risk presented by coronavirus infection. Turkey is one of the most affected countries by COVID-19 pandemics, and we have questioned radiation oncologists who are already working in a revealed unfortunate increase percentage of depression among radiation oncologists compared with the normal population. Moreover, the depression group had significantly higher scores in terms of anxiety and secondary trauma. Thus, it is inevitable to expose the negative consequences of this pandemic in Turkey as well as other countries of the world.

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Table 2  Comparison of BDI-groups (Cutoff Point of BDI) according to the variables

| BDI-groups                                                                 | Cut-off point ≤19 n=47 | Cut-off point >19 n=25 | p     |
|---------------------------------------------------------------------------|------------------------|------------------------|-------|
| Age                                                                       | 42.53                  | 39.20                  | 0.032*|
| The effect of COVID-19 on psychology                                      | 6.27                   | 9.02                   | <0.001**|
| The effect of social isolation                                            | 5.94                   | 8.02                   | <0.001**|
| STSS                                                                      | 30.68                  | 34.28                  | 0.035*|
| STAIS                                                                     | 45.46                  | 60.46                  | <0.001**|
| STAIT                                                                     | 75.92                  | 82.21                  | 0.002**|
| BAI                                                                       | 9.31                   | 21.04                  | <0.001**|
| Gender, n (%)                                                             |                        |                        |       |
| Male                                                                      | 12 (18.8)              | 5 (5.6)                | 0.090 |
| Female                                                                    | 34 (46.5)              | 21 (29.2)              |       |
| Working in Pandemic service or polyclinic?, n (%)                         |                        |                        |       |
| Yes                                                                       | 9 (13.2)               | 8 (11.1)               | 0.116 |
| No                                                                        | 38 (52.1)              | 17 (23.6)              |       |

*p<0.05, **p<0.01. BDI: Beck depression inventory; STSS: Secondary traumatic stress scale; STAIS: State-trait anxiety inventory-state; STAIT: State-trait anxiety inventory-trait; BAI: Beck anxiety inventory; Std. Dev: Standard deviation

Table 3  The correlation matrix

| (1)  | (2)  | (3)  | (4)  | (5)  | (6)  | (7)  |
|------|------|------|------|------|------|------|
| 1    | 0.654** | 1    | 0.071 | 0.661** | 0.021 | 0.592** |
| STSS | 0.027 | 1    | 0.477** | 0.005 | 0.051 | 0.431** |
| STAIS| 0.005 | 1    | 0.159 | 1     | 0.054 | 0.159 |
| STAIT| 0.159 | 1    | 0.819** | 0.029 | 0.074 | 0.688** |
| BDI  | 0.591** | 0.689** | 1    | 0.495** | 0.110 | 0.495** |

*p<0.05; **p<0.01. STSS: Secondary traumatic stress scale; STAIS: State-trait anxiety inventory-state; STAIT: State-trait anxiety inventory-trait; BDI: Beck depression inventory; BAI: Beck anxiety inventory
Results, radiation oncologists can suffer from the situation of the vulnerable status of their patients during this process. Some of the previous studies reported that working in a pandemic clinic is a severe risk factor for psychological disturbances in healthcare workers.[21] As a result, the higher percentage of depression and anxiety levels can be associated with secondary trauma in radiation oncologists beside the acceptable risk factors for developing anxiety and depression during pandemic conditions.

Our study has several limitations. The present study is based on an online survey, and we could not assess participants face to face. However, this limitation is related to the outbreak condition. Another limitation is that self-reported scales for anxiety, depression, and stress are not sufficient for making a psychiatric diagnosis. There is no specific scale for COVID-19; thus, we created simple questions about the knowledge and effects of the psychological status of COVID-19 pandemic, which can be regarded as subjective.

**Conclusion**

The present study is one of the first to demonstrate the effects of COVID-19 pandemic on depression, anxiety levels, and secondary trauma on a special physician population as radiation oncologists. We suggest that more studies are needed to investigate secondary trauma and its associated effects on physicians and healthcare workers during the COVID-19 pandemic.

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**Ethics Committee Approval:** The study was approved by the Koc University Ethics Committee (No: 2020.111. IRB1.022, Date: 25/03/2020).

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| Appendix |
|----------|
| 1. Are you actively working at a pandemic outpatient clinic or service? |
| 1. Yes |
| 2. No |
| 2. Do you have any medical history of mental disorders? |
| 1. Yes |
| 2. No |
| 3. Please identify the level of knowledge that you have on the COVID-19 pandemic using the following scale (0: “I have no idea,” 10: “My knowledge is perfect.”): |
| () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10 |
| 4. Do you think that the COVID-19 pandemic has affected your psychological health (0: “No”, 10: “Absolutely”)? |
| () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10 |
| 5. Do you think that the social isolation due to the pandemic has affected your psychological well-being (0: “No”, 10: “Absolutely”)? |
| () 0 () 1 () 2 () 3 () 4 () 5 () 6 () 7 () 8 () 9 () 10 |