Psychosocial effects and clinic reflections of the COVID-19 outbreak in patients with acromegaly and Cushing’s disease

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Abstract

Purpose Patients with acromegaly and Cushing’s disease (CD) may experience significant problems related to the COVID-19 outbreak. We aimed to investigate the psychosocial effects of the pandemic and reveal the follow-up characteristics.

Methods The single center, cross-sectional, web-based survey study included patients with acromegaly and CD, PCR-confirmed COVID-19 patients and healthy volunteers without known any chronic disease. The semi-structured sociodemographic data form, The State-Trait Anxiety Inventory (STAI) and Impact of Event Scale-Revised (IES-R) were used.

Results We examined 583 people (217 acromegaly, 127 CD, 102 PCR-confirmed COVID-19 patients and 137 healthy controls). The frequency of abnormal state anxiety and post-traumatic stress disorder (PTSD) were similar in patients with acromegaly and CD and healthy controls, and higher in PCR-confirmed COVID-19 patients than in these three groups (p < 0.001 for both). The frequency of abnormal trait anxiety was higher in patients with acromegaly and PCR-confirmed COVID-19 compared to patients with CD and healthy controls (p = 0.027, p < 0.001, respectively). There were no significant differences between the acromegaly and CD groups in terms of follow-up characteristics and perception of the severity of the COVID-19 outbreak (p > 0.05 for all). But, the treatment discontinuation rate was higher in patients with acromegaly than CD (p = 0.012).

Conclusions Our findings indicate that acromegaly and CD patients are psychologically less affected than PCR-confirmed COVID-19 patients and exhibit similar findings the general population. The clinicians should consider the psychosocial effects, as well as focus on the regular follow-up and medical treatments of these patients during the outbreak.

Keywords COVID-19 · Acromegaly · Cushing’s disease · Anxiety · Post-traumatic stress disorders
Introduction

Coronavirus disease 2019 (COVID-19), which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has already affected more than 90 million people and caused over 1.9 million deaths worldwide since the first case was confirmed, in Wuhan, China, in the late December of 2019 [1]. SARS-CoV-2 is known to primarily affect the respiratory system, however, studies show that its effects expand also to other organs such as the brain, heart, kidneys, skin, and gastrointestinal system [2–5].

The first confirmed case in Turkey was declared by the government on March 11th, 2020. Unfortunately, 2,336,476 people were diagnosed and 22,981 people died due to COVID-19 in the period between the detection of the first case and January 11th, 2021 [6]. After the confirmation of the first case, many public and private hospitals were selected to be “pandemic hospitals” by the government to combat COVID-19, and new inpatient wards where only COVID-19 patients were treated were established in these hospitals. Additionally, flexible working hours were introduced for healthcare workers, the routine appointments of patients were reduced in all outpatient clinics and non-emergency operations were postponed to prevent the loss of the workforce. Although these new practices initially seemed positive, they have led to uncertainties in the follow-up and treatment processes of individuals with chronic diseases who need regular assessments in hospitals.

Individuals with chronic diseases may experience psychological difficulties during the COVID-19 outbreak for various reasons. In many studies conducted on the general population addressing the psychosocial effects of the COVID-19 outbreak, the presence of chronic diseases has repetitively been identified as risk factors for the development of psychological difficulties [7–9]. Acromegaly and Cushing’s disease (CD), like other chronic diseases, cause large numbers of comorbidities, putting individuals at risk for COVID-19. Additionally, the fact that the patients suffering from these diseases have to use medications that necessitates regular follow-up at outpatient clinics. Alongside the difficulties experienced attempting regular follow-ups during the outbreak at outpatient clinics, it can be said that these patients face serious psychosocial hardships.

It is known that psychological difficulties and the psychiatric disorders that develop as a result of these difficulties may negatively affect the course of chronic diseases. In the present study, we aimed to investigate the psychosocial effects of the COVID-19 outbreak on patients with acromegaly and CD and reveal the follow-up characteristics, risk perception for present diseases and problems with treatment.

Methods

Participants and procedure

The single center, cross-sectional, web-based survey study included patients with acromegaly and CD who were followed at the Endocrinology and Metabolism outpatient clinic of Istanbul University-Cerrahpasa, Cerrahpasa Medical School. The positive control group consisted of patients with PCR-confirmed COVID-19 who were followed at inpatient clinic (not in the intensive care unit) of our university hospital between the 1st and 22nd of May 2020 and had in majority mild and moderate disease, and the negative control group consisted of healthy volunteers without any known chronic diseases. The healthy volunteers were recruited through the social media platforms of three different researchers (ED, ST, SST) who were blinded to the results and did not have in common any mutual contacts. Healthcare professionals were excluded from the study.

Healthy volunteers were asked to self-report the presence of any known chronic disorders in the questionnaire and those having any comorbid condition(s) were excluded. Similarly, hospitalized COVID-19 patients who had chronic or comorbid diseases were excluded. Finally, the control groups were formed similar to all of patients in terms of age, marital status and years of education.

An invitation letter, a brief description of the study was sent to participants via social media platforms, such as WhatsApp and Facebook groups between the 27th of April and the 27th of June 2020. Participants gave their consent to participate in the study by clicking the study link sent to them. The waiting period determined to collect the initial responses was one week. A reminder e-mail was sent to participants once a week over the 4-week period. Participants were invited to complete the survey only once and were asked to ignore the reminder e-mails if they had already filled out the questionnaire. All participants who wanted to take the survey were informed that the completion of the questionnaire was anonymous and voluntary.

The study was designed using Google Forms. For this study, a Google account "https://forms.gle/ti6SzwnYGkEsdYrb8" was set up and managed by the lead researcher to collect survey responses. The responses to the questionnaire were collected anonymously and recorded on the designed platform. The questionnaire contained three parts: part I consisted of 30 questions about sociodemographic data form prepared by the authors, part II contained the State-Trait Anxiety Inventory (STAI I-II) and part III contained the Impact of Event Scale-Revised (IES-R). The estimated time to complete the survey was between 13 and 18 min.
Measures

Sociodemographic data form

This data form consisted of questions about the individuals’ age, sex, marital status, education status and employment status, number of people living together in the participants’ home, their comorbidities, their follow-up characteristics, risk perception for present diseases and problems with treatment in the COVID-19 outbreak. Questions were also posited to gauge their positivity towards COVID-19 and the number of individuals in their family who died due to COVID-19.

State-trait anxiety inventory (STAI S-T)

The State-Trait Anxiety Inventory (STAI) was used to measure the presence and severity of existing anxiety symptoms and general anxiety tendencies. It included two subscales (state and trait) consisting of a 20-item self-report questionnaire. First, the state-anxiety subscale (STAI-S) evaluated the current state of anxiety and asks how participants feel “right now”. Then, the trait-anxiety subscale (STAI-T) evaluated relatively stable aspects of “anxiety tendencies”. Increased scale scores showed the presence of higher levels of anxiety. The scores for the STAI questionnaire ranged from 20 to 80 points and was split into four groups: no anxiety (0–20), mild (21–39), moderate (40–59), and severe anxiety (60–80). An abnormal STAI score was subject when the participants’ score was ≥ 40.

The validity and reliability of the Turkish version of the scale was evaluated by Oner and Le Compte [10]. Cronbach’s Alpha internal consistency reliability coefficients were found to be between 0.94 and 0.96 for the state-anxiety, and between 0.83 and 0.87 for the trait-anxiety subscales.

Impact of event scale-revised (IES-R)

The Impact of Event Scale-Revised (IES-R) was developed by Weiss and Marmar, as a 5-point Likert-type inventory (ranging from 0 to 4) that assessed symptoms of posttraumatic stress in relation to any event [11]. IES-R has been repeatedly used in the literature to assess posttraumatic stress disorder after various traumatic situations [12–15]. In the present study, as in various others, it was used to measure stress after the COVID-19 pandemic [16–19]. It consisted of a 22-item self-report questionnaire and three subscales (intrusion, avoidance and hyperarousal). Increased scale scores showed the presence of higher symptoms of posttraumatic stress disorder. Although the original scale did not have a cut-off value, Creamer et al. later set 33 as the IES-R score cut-off value to indicate the presence of PTSD (posttraumatic stress disorders) [20]. In our study, we evaluated our results according to the IES-R total, subscale scores and the IES-R cut-off value (total scores ≥ 33) as indicators of the presence of PTSD.

The validity and reliability of these scales in Turkish was evaluated by Corapcioglu et al. [21]. Cronbach’s Alpha internal consistency reliability coefficients were found as 0.94 for the whole group and between 0.87 and 0.94 for the various study groups. We used the validated Turkish version of the questionnaire with one slight modification (we replaced the word “outbreak” for “event”).

Ethical issues

The study was approved by the local ethics committee of the Istanbul University-Cerrahpasa, Cerrahpasa Medical Faculty (Decision No: 56,321 dated 22 April, 2020). And all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Data analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software (version 21.0). Data were first analyzed for normality using the Kolmogorov–Smirnov test. Continuous variables were expressed as mean ± standard deviation (SD) and/or medians [interquartile range (IQR)]. Student’s t-test or analysis of variance (ANOVA) were used to compare means between groups with normal data distributions. Medians were compared using the Mann–Whitney U test and the Kruskal-Wallis test. Spearman’s rank order test and Pearson’s correlation test were used to calculate the correlation coefficients between continuous variables. Frequencies were compared using Pearson’s and Fisher’s exact tests. The results were evaluated at a 95% confidence interval, a p-value < 0.05 was considered statistically significant.

Results

Response rate

In total, we sent a study link to 1858 participants (664 acromegaly, 398 CD, 594 healthy controls and 202 PCR-confirmed COVID-19 patients). We collected 775 responses in the survey, 217 from acromegaly patients (response rate 32.7%), 127 from CD patients (response rate 31.9%), 303 from healthy controls (response rate 51%), 128 from
PCR-confirmed COVID-19 patients (response rate 63.4%). 137 healthy controls and 102 PCR-confirmed COVID-19 patients were selected in accordance with the match criteria. Finally, data analysis was performed on 583 participants (Fig. 1).

Participants’ characteristics

The sociodemographic characteristics of participants in each group are summarized in Table 1. The comorbid diseases in patients with acromegaly and CD are shown in Table 2.

Comparison of the groups in terms of STAI and IES-R scores

The comparison of STAI-S and STAI-T scores between groups were shown in Table 3. While patients with acromegaly and PCR-confirmed COVID-19 had higher trait anxiety scores than controls, state anxiety scores were highest in the patients with PCR-confirmed COVID-19. Although patients with CD and healthy controls had similar frequency of abnormal trait anxiety (p = 0.913), this rate was higher in patients with acromegaly and PCR-confirmed COVID-19 than controls. Also, we determined that COVID-19-time course caused a low and similar rate of abnormal state anxiety in patients with acromegaly, CD and in healthy controls (p = 0.974), and there was a frequency of heightened state anxiety in PCR-confirmed COVID-19 patients (Fig. 2).

In terms of whether the outbreak was perceived to cause PTSD, the mean IES-R total and subscales scores were higher in PCR-confirmed COVID-19 patients (Table 3). Also, we determined that COVID-19-time course caused a low and similar frequency PTSD in patients with acromegaly, CD and in healthy controls (p = 0.974), and there was a frequency of heightened state anxiety in PCR-confirmed COVID-19 patients (Fig. 2).

Follow-up characteristics and the risk perception of patients during the COVID-19 outbreak

Patients’ follow-up characteristics, risk perception for present diseases and treatment problems during the COVID-19 outbreak are shown in Table 4. There were no significant differences between the acromegaly and CD groups in terms of these parameters except the discontinuation rate of medical treatments. This rate was higher in patients with acromegaly than in patients with CD (19.4% vs. 10.2%, p = 0.012).

There were no significant differences between groups for all IES-R and STAI scores, when patients with acromegaly and with CD were separately divided into two groups according to the presence of comorbidities, perception of the severity of the COVID-19 outbreak, considering acromegaly and CD and its treatment as a risk factor during the pandemic and thinking that missing a clinic appointment was a problem (p > 0.05 for all).

COVID-19 outbreak-related characteristics of the participants

In both the acromegaly and CD groups, one person had COVID-19 and recovered. Nobody was hospitalized for any reason in these groups. The number of PCR-confirmed COVID-19 individuals in their families were 19 (8.8%) in the acromegaly group, 11 (8.7%) in the CD, 49 (48%) in the PCR-confirmed COVID-19 patient group, and 11 (8%) in the controls. Death from COVID-19 was not present in any of the four groups. The number of healthcare professionals included in the family members of these groups were similar (16.6% in acromegaly, 15% in CD, 18.8% in PCR-confirmed COVID-19 patients and 21.2% in controls, p = 0.373).

The number of individuals who thought the outbreak was serious was 160 (73.7%) in the acromegaly, 101 (79.5%) in the CD, 77 (75.5%) in the PCR-confirmed COVID-19 patient group and 96 (70.1%) in the control group. There were no significant differences between the groups (p = 0.209).

Discussion

In the present study, we investigated the effects of the outbreak on the psychological conditions of patients suffering from acromegaly and CD, two important chronic endocrinological diseases. We found that PCR-confirmed COVID-19 patients had higher levels of state anxiety and PTSD caused by the outbreak. The state anxiety levels of patients with acromegaly and CD were similar to those of healthy controls. We also observed lower frequency PTSD in the three other groups when compared with the PCR-confirmed COVID-19 patients. Additionally, abnormal trait anxiety was higher in patients with acromegaly and PCR-confirmed COVID-19 in comparison to patients with CD and healthy controls.

Early studies that investigated the psychological effects of COVID-19 had shown that this disease increased anxiety levels in the general population [7, 22–24]. The prevalence of anxiety was between 31.9 and 33% in different populations studied [25, 26], and 45.1% in Turkey [8]. In our study, we determined that 58.4% of healthy controls had abnormal trait anxiety and 49.6% had abnormal state anxiety, higher than the rates found in the general population. Due to the unique cultural characteristics of the Turkish population, such as close social relations and strong kinship ties, Turkish
Fig. 1  The flowchart showing the patients and controls’ recruitment process

Participants who were sent a study link
(n = 1858)

- Acromegaly  
  (n = 664)
- CD  
  (n = 398)
- HC  
  (n = 594)
- COVID-19  
  (n = 202)

Responses  
(n = 775)

- HC  
  (n = 303)  
  RR: 51%  
  with any known chronic disease  
  (n = 92)

  - Acromegaly  
    (n = 217)  
    RR: 32.7%  

  - CD  
    (n = 127)  
    RR: 31.9%

- COVID-19  
  (n = 128)  
  RR: 63.4%  
  part. who differed in terms of socio. features  
  (n = 26)

  - participants who differed in terms of sociodemographic features  
    (n = 74)

  - HC who were included study  
    (n = 137)

  - COVID-19 who were included study  
    (n = 102)

Data analysis was performed  
(n = 583)

*CD: Cushing Disease  
HC: healthy controls  
RR: response rate
individuals may have been more affected by the isolation and quarantine conditions during the COVID-19 outbreak.

Although acromegaly and CD may predispose individuals to psychosocial impairments, the rate of abnormal state anxiety in patients with acromegaly and CD was similar to the that of healthy controls. We also observed that acromegaly patients had higher levels of abnormal trait anxiety than healthy controls (70.5% of them). The rate of state anxiety in patients with CD was similar to the that of healthy controls.
or trait anxiety in previous studies has been shown to vary between 10 and 13% [27–29]. These rates were quite low compared to the rate found in our study. Our findings indicate that trait anxiety is slightly, but significantly, higher in acromegaly patients when compared to healthy controls during the COVID-19 pandemic. The anxiety, which has reached very high levels in patients with acromegaly during this period, may be associated with the use of mostly injectable drugs, which should be administered periodically by experienced healthcare professionals in the treatment of acromegaly, resulting in these patients’ greater need for healthcare services. During the outbreak, the restrictions on access to hospitals for various reasons and the inability to receive medical treatment may have been stressful. In the literature, Giustina et al. revealed that more than one-quarter of

| Table 2 | The comorbid diseases in patients with acromegaly and CD |
|---------|---------------------------------------------------------|
| Variables, n (%) | Acromegaly (n = 217) | CD (n = 127) | P |
| Presence of any comorbid disease | 107 (49.3) | 71 (55.9) | 0.285 |
| Comorbidities | Diabetes mellitus | 58 (26.7) | 33 (26) | 0.981 |
| | Hypertension | 56 (25.8) | 46 (36.2) | 0.041 |
| | OSAS | 30 (13.8) | 7 (5.5) | 0.026 |
| | COPD | 15 (6.9) | 15 (11.8) | 0.120 |
| | Heart failure | 9 (4.1) | 8 (6.3) | 0.374 |
| | Cancer | 8 (3.7) | 4 (3.1) | 0.999 |
| | Immunodeficiency | 2 (0.9) | 4 (3.1) | 0.273 |

CD: Cushing’s Disease, OSAS: obstructive sleep apnea syndrome, COPD: chronic obstructive pulmonary disease

| Table 3 | Comparison of the groups in terms of IES-R and STAI scores |
|---------|----------------------------------------------------------|
| Scales | Acromegaly (n = 217) | CD (n = 127) | COVID-19 (n = 102) | Controls (n = 137) | P |
| IES-R | | | Mean ± SD | | |
| Total | 23.2 ± 16.3 | 22 ± 14.3 | 34.8 ± 12.4 | 22 ± 13.9 | <0.001* |
| Intrusion | 7.1 ± 6.2 | 6.7 ± 5.9 | 11.9 ± 5.5 | 7 ± 5.1 | <0.001* |
| Avoidance | 10.3 ± 6.3 | 10.3 ± 5.9 | 14.3 ± 4.9 | 10.4 ± 5.8 | <0.001* |
| Hyperarousal | 5.7 ± 5.6 | 5 ± 4.6 | 8.7 ± 4.5 | 4.6 ± 4.9 | <0.001* |
| STAI | | | | |
| STAI-S | 39.5 ± 10.4 | 38.8 ± 10.8 | 48.9 ± 9.1 | 38.9 ± 11.5 | <0.001* |
| STAI-T | 44.4 ± 9.2 | 43.5 ± 9.9 | 46.1 ± 7.3 | 41.5 ± 10.2 | 0.002† |

CD: Cushing’s disease, IES-R: Impact of Event Scale-Revised, STAI: State-Trait Anxiety Inventory
Post-hoc analysis results (adjusted p value in Bonferroni correction)
*COVID-19 vs. Acromegaly, P < 0.001; COVID-19 vs. Cushing, P < 0.001; COVID-19 vs. Controls, P < 0.001
†COVID-19 vs. Controls, P = 0.001, Acromegaly vs. Controls, P = 0.049

Fig. 3 The frequency of PTSD among groups according to the IES-R
patients reported difficulties accessing therapy, possibly supporting this anxiety [30]. This was the first study which had examined the real-world impacts of COVID-19 on patients with acromegaly; but the authors made no further mention of the psychosocial effects caused by this situation.

As for patients with CD, anxiety rates varying between 12% [31] and 66% [32] were reported in patients with active CD, and a rate of 20% was reported for those in remission [33]. In addition, Dorn et al. revealed that anxiety disorders were present in 7.1% of the patients in the third month of their treatment, but that anxiety regressed in all patients after 6 to 12 months [34]. In light of these rates, although there were no significant differences found between patients with CD and healthy controls in terms of state or trait anxiety in our study, it can be concluded that anxiety levels in patients with CD increased during the outbreak period. Specifically, the levels were 58.4% for trait anxiety, 49.6% for state anxiety. We also found that the rates of abnormal state and trait anxiety were 84.3% and 85.3% respectively in PCR-confirmed COVID-19 patients; thus, significantly higher than all other groups. In the literature, a systematic review and meta-analysis shows that the prevalence of anxiety was the highest (56%) among patients with COVID-19 in comparison to the general population [26]. On the contrary, Zhang et al. reported that there were no differences in anxiety levels between patients with COVID-19 and the general population [35].

A recent systematic review reported that the prevalence of PTSD in the general population during the COVID-19 outbreak ranged from 7 to 53.8% [36]. In our study, we found no significant differences in terms of PTSD (IES-R score ≥ 33) between the acromegaly group (24.9%), CD group (24.4%) and healthy controls (20.4%). This finding suggests that although having a chronic illness predisposes patients with acromegaly and CD to be strongly affected by COVID-19, they do not experience the pandemic as more traumatic than the general population. As a matter of fact, in a study by Poyraz et al. (2020), researchers evaluated

### Table 4 Follow-up characteristics, risk perception for present diseases and problems with treatment in the COVID-19 outbreak

| Questions                                                                 | Acromegaly (n = 217) | CD (n = 127) | P     |
|---------------------------------------------------------------------------|----------------------|--------------|-------|
| **Is the COVID-19 outbreak a very serious incident?**                       |                      |              |       |
| Yes                                                                       | 160 (73.7)           | 101 (79.5)   | 0.279 |
| No                                                                        | 57 (26.3)            | 26 (20.5)    |       |
| **Consulting own doctor about COVID-19**                                   |                      |              |       |
| Yes                                                                       | 39 (18)              | 22 (17.3)    | 0.995 |
| No                                                                        | 178 (82)             | 105 (82.7)   |       |
| Last visit time (months ago)                                              |                      |              |       |
| Yes                                                                       | 4 (3–6)              | 4 (3–6)      | 0.582 |
| No                                                                        | 100 (46.1)           | 63 (49.6)    | 0.528 |
| **Missing outpatient clinic appointment**                                  |                      |              |       |
| Yes                                                                       | 100 (46.1)           | 63 (49.6)    | 0.528 |
| No                                                                        | 117 (53.9)           | 64 (50.4)    |       |
| **Missing this appointment is a problem?**                                |                      |              |       |
| Yes                                                                       | 114 (52.5)           | 75 (59.1)    | 0.289 |
| No                                                                        | 103 (47.5)           | 52 (40.9)    |       |
| **Are having acromegaly/CD a risk for COVID-19?**                          |                      |              |       |
| Yes                                                                       | 141 (65)             | 84 (66.1)    | 0.919 |
| No                                                                        | 76 (35)              | 43 (33.9)    |       |
| **Are medical treatment of acromegaly/CD a risk for COVID-19?**           |                      |              |       |
| Yes                                                                       | 18 (8.3)             | 13 (10.2)    | 0.750 |
| No                                                                        | 167 (77)             | 91 (71.7)    |       |
| No any medication                                                         | 32 (14.7)            | 23 (18.1)    |       |
| **Have acromegaly/CD medical treatment been discontinued?**               |                      |              | 0.012 |
| Yes                                                                       | 42 (19.4)            | 13 (10.2)    |       |
| No                                                                        | 141 (64.9)           | 91 (71.7)    |       |
| No any medication                                                         | 34 (15.7)            | 23 (18.1)    |       |
| **Problems in drug supply**                                               |                      |              | 0.286 |
| Yes                                                                       | 10 (4.6)             | 10 (7.9)     |       |
| No                                                                        | 175 (80.7)           | 94 (74)      |       |
| No any medication                                                         | 32 (14.7)            | 23 (18.1)    |       |
the protracted psychiatric symptoms after COVID-19, and showed that the severity of PTSD symptoms did not change to the presence of a chronic medical disease [37]. Patients with PCR-confirmed COVID-19 had significantly higher rates (48%) of PTSD than the other three groups. Among the 714 hospitalized but stable COVID-19 patients, the rate of PTSD was found to be 96.2% [38]. We may say that contracting COVID-19 is a very traumatic experience due to the fact that patients feel they will face many additional catastrophic situations.

In our study, there may be other reasons for the lack of differences in terms of state-anxiety and PTSD levels between patients with acromegaly, patients with CD and healthy controls. Most of the patients with acromegaly or CD had regular follow-up visits and the median last visit time was 4 months prior to the survey. Approximately two-thirds of the patients in both groups considered acromegaly and CD a risk for COVID-19 and took the necessary precautions. 90% of patients with acromegaly or CD did not consider treatment of the present diseases as a risk and the discontinuation rate of present medical treatment did not exceed 20%. As a result of all this, we can say that the risk perception related to COVID-19 has decreased due to regular follow-up visits and medical treatment and that the psychopathological effects of the pandemic are similar between the patients and the rest of society. However, in both the acromegaly and CD groups, it can be extrapolated that the perceived threat disappeared as a result of lessened contact with COVID-19. The fact that no patients or their family members contracted COVID-19 at a higher rate or severity than the general population may have resulted in less anxiety and PTSD as well.

In the present study, several limitations should be considered. First, in our web-based study, the participants were not obligated to fill in descriptive information such as name, surname or patient ID numbers for the ethical reasons. Therefore, we could not reach all of the medical record data regarding the clinical features, biochemical findings and remission status of patients with acromegaly and CD. This could have offered the opportunity to evaluate the psychological conditions of patients depending on their disease activity. Second, we excluded in blinded manner respondents who differed from patients in terms of socioeconomic features. This may have biased our results. On the other hand, this approach gave us the opportunity to create more homogenous and similar groups and decrease confounding factors. Third, due to the female preponderance among patients with CD [39], we formed control groups similar to only patients with acromegaly for sex. Finally, as a feature of survey studies, the presence of chronic disease may not reflect the actual situation as it was collected based on self-report of the participants.

In conclusion, we demonstrated that patients with acromegaly and CD experienced similar impacts when compared to healthy controls during the COVID-19 outbreak in terms of anxiety and PTSD. The abnormal trait anxiety in patients with acromegaly was higher compared to healthy controls. In addition, having a confirmed diagnosis of COVID-19 linked to the most heightened state of both anxiety and PTSD development. In light of these findings, clinicians should consider the psychosocial effects of the pandemic and focus on the regular follow-up and medical treatments of these patients during the outbreak.

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**Data availability** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Declarations**

**Conflict of interest** The authors declare no conflicts of interest that could be perceived as prejudicing the impartiality of the research reported.

**Ethical approval** The study was approved by the local ethics committee of the Istanbul University-Cerrahpasa, Cerrahpasa Medical Faculty (Decision No: 56321 dated 22 April, 2020). And all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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