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COVID-19 Associated Anxiety, Grief, Anger, and Perceived Stress in Individuals with Multiple Sclerosis

Multipl Sklerozlu Bireylerde COVID-19 İlişkili Kaygı, Keder, Öfke ve Algılanan Stres

Araştırma Makalesi – Research Article

Seda DAĞLI
Amasya Sabuncuoğlu Şerefeddin Eğitim ve Araştırma Hastanesi, seda@visel.com.tr
ORCID Numarası|ORCID Numbers: 0000-0001-6786-045X

Ekin Öykü BAYLAM
Süleyman Demirel Üniversitesi, Tıp Fakültesi Nöroloji AD, ekin.oyku.baylamm@gmail.com
ORCID Numarası|ORCID Numbers: 0000-0003-3880-3522

Duygu AYDEMİR
Süleyman Demirel Üniversitesi Tıp Fakültesi Nöroloji AD, duygu.gokoglu.93@gmail.com
ORCID Numarası|ORCID Numbers: 0000-0001-7623-8275

Neslişah YILDIRIM
Süleyman Demirel Üniversitesi Tıp Fakültesi Nöroloji AD, neslshy91@gmail.com
ORCID Numarası|ORCID Numbers: 0000-0002-8692-4284

Özge TÜRK
Süleyman Demirel Üniversitesi Tıp Fakültesi Nöroloji AD, trkozge1@gmail.com
ORCID Numarası|ORCID Numbers: 0000-0002-8115-6394

Melike DOĞAN ÜNLÜ
Süleyman Demirel Üniversitesi Tıp Fakültesi Nöroloji AD, dr.melikedoganunlu@gmail.com
ORCID Numarası|ORCID Numbers: 0000-0002-4424-044X

Serpil DEMİRCİ
Süleyman Demirel Üniversitesi Tıp Fakültesi Nöroloji AD, serpildemirci@sdu.edu.tr
ORCID Numarası|ORCID Numbers: 0000-0003-1561-1296

Öz

COVID-19 salgını toplumun tüm kesimlerini etkilemiştir. Bu çalışmada multipl skleroz (MS) olgularında, sağlık çalışanlarında ve genel toplum örneğinde pandemik durumlara bağlı kaygı, keder, öfke ve algılanan stres düzeyleri değerlendirilmiş ve MS'li bireylerin yaşadıkları stres sağlık çalışanları ve halk ile karşılaştırılmıştır. Çalışma örneklemini 63 MS'li birey, 59 sağlık profesyoneli (HCP) ve 99 sağlıklı gönüllü (HV) oluşturdu. Tüm katılımcılara UCLA-Covid-19 tarama testi, Posttravmatik Stres Bozukluğu -belirti kontrol listesi, Hasta Sağlık Anketi-9, Yaygın Anksiyete Bozukluğu-7 Ölçeği, Olayların Etkisi Ölçeği, Kessler-10 ölçeği ve Sürekli Öfke Ölçeği uygulanmıştır. Grupların sosyo-demografik özellikleri, MS grubunda kadınların ağırlıklı olması ve görece düşük eğitim düzeyi dışında hemen hemen aynıydı. Covid-19 nedeniyle hastane yatışı, test pozitifliği ve karantina oranları gruplar arasında farklılık göstermedi. Pandemi koşulları herkesi çaresiz ve umutsuz hissettirmiştir, ancak bu HCP grubunda çok daha belirgindi. COVID-19 ilişkili en önemli kaygı nedeni MS'li bireylerde hastalığa yakalanma, sağlık profesyonellerinde hastalığı aile üyelerine bulaştırma ve sağlıklı gönüllülerde kapanma nedeniyle iş ve gelir kaybı yaşamaktı. MS'li bireyler ve sağlık profesyonellerinin yaşadığı stres düzeyi sağlıklı gönüllülerdekinden anlamlı derecede yüksekti. Benzer şekilde, algılanan stres düzeyi MS ve HCP gruplarında aynı düzeyde fakat HV grubundan anlamlı derecede daha fazlaydı. MS'li bireyler sağlık profesyonelleri kadar kaygılı ve çökkündü. Buna karşın sağlıklı gönüllüler hem MSli bireylerden hem de sağlık profesyonellerinden daha fazla psikolojik sıkıntı yaşadıklarını ifade etmişlerdir. Sonuçlarımız, pandemi sırasında MS'li kişilerde depresyon, anksiyete ve stresin yüksek olduğunu göstermektedir.
Anahtar Kelimeler: COVID-19, multipl skleroz, kaygı, keder, öfke

Abstract:

The COVID-19 pandemic has affected all segments of society. In this study, the level of anxiety, grief, anger and perceived stress related to pandemic conditions were evaluated in multiple sclerosis (MS) cases, healthcare professionals and lay public and, the stress experienced by individuals with MS was compared with health care professionals and lay public.

Study sample were composed of 63 persons with MS, 59 healthcare professionals (HCP), and 99 healthy volunteers (HV). All participants were administered UCLA-Covid-19 screening test, Posttraumatic Stress Disorder - symptom checklist, Patient Health Questionnaire-9, Generalized Anxiety Disorder-7 Scale, Impact of Events Scale, Kessler-10 scale and Trait Anger Scale. Socio-demographic features of the groups were almost same except for female preponderance and relatively low education in MS group. Hospitalization, test-positivity and quarantine rates due to COVID-19 did nor differ among groups. Pandemic conditions have made everyone feel helpless and hopeless, however, this was remarkably much more evident in HCPs. The most significant concern related with COVID-19 was contracting the disease for persons with MS, transporting the disease to their family members for HCP, and job/income loss due to lockdown for HVs. The stress level experienced by individuals with MS and health care professionals was significantly higher than that of healthy volunteers. In a similar way, the perceived stress level was the same in MS and HCP groups, but significantly higher than in the HV group. Persons with MS were as anxious and depressed as HCPs. Nevertheless, HVs stated that they experienced more psychological distress than both HCPs and persons with MS. Our results yield that depression, anxiety and stress were high among persons with MS during the pandemic.
Keywords: COVID-19, multiple sclerosis, anxiety, depression, anger

As humans have spread across the world, so have communicable disease. Infectious disease are known to exist from the humankind's hunter-gatherer days, but the shift to agrarian life leading to the creation of more closely connected communities made epidemics more likely and people more prone and vulnerable to it. There have been several deadly pandemics throughout the human history. Traces of the earliest ones, which also can be found in the holy books, date back to 1350 BC. Successive pandemic outbreaks throughout history have decimated societies, determined the fate of wars and

countries, while paradoxically by paving the way for innovations and advances in science, shaped the human civilization in terms of the economic, political, social and medical sciences.[1] Since December 2019, the whole world has been shaken by the new corona virus epidemic, which has spread incredibly fast and progressed fatally. The main containment strategies to prevent the spread of disease, intending to protect the public, were quarantine and isolation, primarily referring to a restriction of movement and limitation of personal contacts. These physical control measures has significantly affected social life as well as the medical problems it has created. Preventive measures -including home quarantine, social distance, curfews, which covered all segments of the society during the pandemic period- is also known to cause psychological stress, especially for those who need social support for difficult times. The imposed new rules, changing social habits and the effects of curfew may affect different social groups disproportionately.[2]

Exposure to or witnessing any stressful, frightening, shocking, scary or distressing event may cause in some individuals mental health problems such as anxiety, depressive symptoms, insomnia, denial, anger and fear. All these symptoms is covered under the term post-traumatic stress disorder (PTSD). After the Covid-19 outbreak, the prevalence of PTSD in the general population has risen from 4% to 41% and the prevalence of major depression has increased by 7%.[3] In a study assessing the psychological effect on quarantined persons during the recent SARS outbreaks, after the containment of the outbreak, 28.9% of respondents had still symptoms of PTSD and 31.2% had symptoms of depression.[4]

It is noted that prolonged was the quarantine continuation, higher was the prevalence of PTSD symptoms, and familiarity or direct exposure to someone with a diagnosis of SARS was also related with PTSD and depressive symptoms.[5] Besides these, factors such as female sex, lower socioeconomic status, interpersonal conflicts, fear of infection, frustration, boredom, inadequate supplies, inadequate information, and lower resilience and social support, financial loss, and stigma were noted to increase the risk of developing mental and psychological problems.[6] The uncertainty surrounding the pandemic outbreak and the fear of the unknown may cause a heightened levels of worry, and anxiety. People's perceptions, interpretations and responses to uncertainty situations may differ cognitively, emotionally and behaviorally. Intolerance to uncertainty may increase the risk of developing PTSD in those with chronic diseases. A recent meta-analysis reports that vulnerable populations have been affected differently in the COVID-19 era.[7]

Multiple Sclerosis (MS) is a chronic, inflammatory, demyelinating disease of the central nervous system affecting both the brain and the spinal cord. MS, characterized by relapses and disability and involvement of different neurological systems, poses a significant emotional and physical burden to individuals with it, interfering with daily activities and family, social and working life, worsens emotional well-being, and reduces quality of life.[8] Uncertainty about the timing and nature of a new relapse and progression of the disease is a common menace and source of stress they face in coping with their condition. There is a complex and reciprocal relation with stress and MS, each promoting the other. The stress experienced with unknowns and uncertainties of this last pandemic outbreak along with the disease-related and daily life-related stresses might have doubled the stress experienced by MS patients and might have led to accumulated burden of distress. Even so, controversial results have been reported in studies conducted in MS patient groups. Some claims significant effects of pandemic on mental health psychosocial adjustment for persons with MS and some others the opposite.[9]

It is not surprising that the frontline health workers caring for COVID-19 patients were the most vulnerable and at risk for experiencing severe distress. More intense shifts, longer working hours, increased level of stress caused by the unprecedented number of critically ill patients, an unpredictable clinical course, a high mortality rate, and the absence of specific treatments and treatment guidelines in

[1] Huremovic, 2019.
[2] Saqib et al.,2023.
[3] Bonavita et al., 2021.
[4] Hawryluck et al., 2004.
[5] Hawryluck et al., 2004.
[6] Bonavita et al., 2021; Brooks et al., 2020; Pennix et al., 2022.
[7] Nam et al., 2021.
[8] Carletto et al., 2016.
[9] Chiu et al., 2021; Altieri et al., 2022; Zarghami et al., 2022; Yalçın et al., 2021.

the initial phase of outbreak exposed them to a continuous physical and psychological stress and put them at a higher risk for developing PTSD when compared with the general population. In several meta-analysis studies it has been shown that the prevalence of PTSD among health-care workers ranges from 7.7% to 38%, and last even after the end of the outbreak.[10] Some important risk factors as well as resilience factors were female sex, young age, exposure level, working role, lower work experience, social and work support, job organization, quarantine, and coping styles.[11]

As noted previously, changed rules, habits and life conditions with the pandemic might have emotional, cognitive, perceptual and behavioral effects which may differ disproportionately among different social groups. The aim of this study was to examine the level of anxiety, grief, anger and perceived stress related to pandemic conditions in multiple sclerosis (MS) cases and compare the stress experienced by them to health workers and lay public.

Materials and Methods

Participants

The study was a cross-sectional study conducted from November 2020 to April 2021. Participants were individuals with MS (n=63), healthcare professionals (HCP) (n=59), and healthy volunteers (HV) (n=99). The MS group is comprised of patients with relapsing-remitting (RR) MS, diagnosed according to McDonald's criteria, and regularly followed-up in the out-patient clinic at the Neurological Department.[12] Inclusion criteria were as follows: being over 18 years old, having a stable RRMS without any episodes of relapse within the last 3 months, being treated with a disease-modifying therapy (DMT), and consent to participate to the study. Those with definite cognitive problems, unable to follow the test instructions, having psychiatric comorbidities and illiterate ones were excluded. A total of 100 consecutive RRMS patients were interviewed, 13 refused to participate. Ten with depression and bipolar disease, 3 with severe cognitive deficits and 3 illiterate person were excluded and data of 8 patients were not analyzed due to missing data. Sixty-three patients were finally included in the study. Health and care professionals were selected among physicians and nurses who worked at several COVID-19 units (including the emergency department, outpatient, intensive care unit, infection ward, isolation ward) in SDU hospital. Group was comprised of 22 physicians, 26 nurses and 11 hospital stuff. Healthy volunteers were recruited by a snowball sampling strategy. For healthy volunteers to be eligible for the study they had to be older than 18 years-old, not suffering from any degenerative or disabling medical condition. Twenty-eight person (28.3%) in the volunteers group declared working in white-collar jobs and the rest in blue-collar jobs.

Data Collection

All participants, agreed to participate after explanation of the purpose of the study, were asked to fill-out a variety of self-report questionnaires. Socio-demographic questionnaire was used to obtain information about age, gender, educational level, place of residence, employment, monthly income, and marital status. They were requested to respond some semi-structured and open ended questions to gauge information about a received diagnosis of Covid-19, contact with people with established diagnosis of Covid-19, loss of beloved ones, being quarantined, and experienced concerns and worries during the outbreak by using UCLA Brief COVID-19 Screen for Child/Adolescent PTSD (2020). All participants also completed the Post-traumatic Stress Disorder (PTSD) test, the Patient Health Questionnaire (PHQ-9), the Generalized Anxiety Disorder-7 Scale (GAD7), the Impact of Events Scale (IES), the K-10 scale, and the Trait Anger and Anger Expression Style Scales.

Post-traumatic Stress Disorder Checklist (PTSD-C) is a self-reported scale developed by Weathers et al (1993) for assessing post-traumatic stress disorder (PTSD). The scale consists of 17 items which correspond to the DSM-III-R symptoms of PTSD. Examinees are instructed to indicate how much they have been bothered by each symptom in the past month using a 5-point Likert scale (0=not at all to 4=extremely). The scale consists of 3 subdimensions; re-experiencing, avoidance and

[10] Sahebi et al., 2021.
[11] Sahebi, et al 2021; Carmassi et al., 2020.
[12] Thompson et al., 2018.

hyper-arousal. Turkish validation and reliability have been studied by Kocabaşoğlu.[13] It has been reported to have a 70% sensitivity and specificity at a cut-off value between 22-24 points with an internal consistency coefficient of 0.922 in Turkish population.[14]

Patient Health Questionnaire (PHQ-9) is a self-rated measure that assess the severity of depressive symptoms with reasonable sensitivity and specificity (Kroenke et al., 2001). Subjects scores how often they have been bothered by some symptoms over the past 2 weeks on a 4-point Likert scale (0=not at all to 3=nearly every day). Total score of 1-4 signifies minimal, 5-9 mild, 10-14 moderate, 15-19 moderately severe and 20-27 severe depression. A total score ≥11 had a sensitivity of 95% and a specificity of 88.3% for major depression in MS population.[15] Turkish validation and reliability has been studied by Sarı.[16]

Generalized Anxiety Disorder Scale (GAD-7) is used to screen the presence and severity of anxiety. The measure holds seven items each scored from zero to three. The total score ranges from 0 to 21. Cut-off scores of 5, 10 and 15 corresponds to mild, moderate and severe anxiety symptoms respectively.[17] It showed an 80% sensitivity and 80% specificity at a cut-off value of 8 in Turkish population.[18]

Impact of Events Scale- Revised (IES-R) is a 22-item self-report measure assessing the severity of subjective distress caused by traumatic events.[19] Participants were asked to select a specific stressful life event and then denote how much they were distressed or bothered during the past seven days by each difficulty listed. Items are rated on a 5-point scale: 0 indicates that the symptom occurs not at all; 1, a little bit; 2, moderately; 3, quite a bit; and 4, extremely. The IES-R yields a total score (ranging from 0 to 88) and subscale scores can also be calculated for the intrusion, avoidance, and hyperarousal subscales. In clinical studies it has been used to determine the severity of PTSD. Turkish validation and reliability have been studied by Çorapçıoğlu.[20] Cronbach internal consistency coefficient was found to be 0.937.

The Kessler Psychological Distress Scale (K-10) is a short, self-report screening scale to measure and monitor the level psychological distress, developed by Kessler.[21] Scale involves 10 questions about emotional states each with a five-level response scale. Each item is scored from one 'none of the time' to five 'all of the time'. Scores of the 10 items are then summed, yielding a minimum score of 10 and a maximum score of 50. People who score under 20 are likely to be well. A score of 20-24 points to a mild, 25-29 to moderate and scores over 30 to a severe psychological distress. Turkish version has been found to be valid and reliable.[22]

Trait Anger and Anger Expression Scale (TA-AES) developed by Spielberg et al (1985) to assess general tendency and expression of angry feelings. The scale consists 34 items of which 10-item evaluates trait anger and 24-item anger expression styles. Respondents indicate how angry they generally felt and tendencies to handle their anger either express openly *(anger-out*), suppress or keep it inside (anger-in) and control anger (anger under control) on a 4-point Likert scale (1:almost never to 4:almost always). The Turkish validity and reliability of the TA-AES has been conducted by Ozer.[23] The reported internal consistency coefficients were 0.79 for trait anger, 0.84 for anger control, 0.78 for anger-out and 0.62 for anger control.[24] For this study only trait anger part used.

Ethical Considerations

The ethical clearance of the study was granted by the local research ethics committee (02/11/2020:24/350) and Ministry of Health (Serpil Demirci-2020-12-24T08_12_37). Participation in the study was anonymous and voluntary. All participants were informed about the study, and their

[13] Kocabaşoğlu et al 2005.
[14] Kocabaşoğlu et al., 2005.
[15] Patten et al., 2015.
[16] Sarı et al 2016.
[17] Spitzer et al., 2006.
[18] Konkan et al., 2013.
[19] Weiss & Marmar, 1997.
[20] Çorapçıoğlu et al 2006.
[21] Kessler et al., 2002.
[22] Altun et al.,2019.
[23] Ozer, 1994.
[24] Ozer, 1994.

consent to participate in the study was required. The study adhered to the ethical standards of the Declaration of Helsinki and Good Clinical Practice guidelines.

Statistical analysis

Responses of all participants were anonymously transferred to an electronic database and were analyzed using SPSS v.20.0 for Windows (IBM, Chicago, Il, USA). The distribution of the variables was evaluated with the Kolmogorov-Smirnov test, and the homogeneity of the variance was evaluated with the Levene test. Data were expressed as mean ± standard deviation for continuous variables and as frequencies (n and/or %) for categorical variables. Categorical variables were evaluated with chi-square test. Mann Whitney U and Kruskal-Wallis test were used to compare continuous variables without normal distribution and one-way ANOVA for normally distributed variables. The Pearson correlation analysis were used to correlate continuous variables. The p value for statistical significance was<0.05.

Results

Distribution of sample characteristics are given in Table1. Healthcare professionals (HCP) were younger than individuals with MS and healthy volunteers (HV), but the difference between the groups was not statistically significant (Table 1). There was no difference among the groups in terms of marital status (p=0.147), monthly income level (p=0.072) and residential area (p=0.063). However, persons with MS as a group were less educated than the healthy volunteers and health care professionals. No statistically significant difference was present among groups in terms of Covid-19 experience including hospitalization, quarantine and test positivity due to Covid-19 (Table 2). Feelings of hopelessness and loss of interest were found to be remarkably high in healthcare professionals (Table 2). On the other hand, HV group concerned more deeply about job/income loss. As a method of protection, 50% of individuals with MS preferred not to leave the house at all, in addition to general mask/distance/cleaning measures. About a quarter of HCP group had stayed away from their homes as a general preventive measure. Concerns about Covid-19 infection differed significantly among groups. The most important concern in MS group was contracting the disease. Whereas HCP group was more anxious about transmitting the disease to their family members and HV group about economic loss due to lockdown (Figure 1).

Socio-demographic factors did not showed any correlation with tests evaluating the psychological impact of pandemic except residence in MS and HV group. Those persons with MS living in rural areas reported more re-experiencing events (12.4±8.97 vs 7.32±7.67, p=0.048) and hyperarousal (10.67±7.45 vs 6.03±5.72, p=0.022) than those living in urban. Whereas healthy volunteers living in rural areas had exhibited more avoidance behavior (0.60±6.23 vs 7.19±6.35, p=0.043).

HV group felt less stressful than MS and HCP groups, whereas the level of stress experienced by individuals with MS was as high as those of healthcare professionals. The impact of the perceived stress including re-experiencing events, avoidance, and hyperarousal was remarkably different between groups (Table 3). Perceived stress level was at the same level in MS patients as in healthcare professionals (p=0.137) and was significantly higher than that experienced by healthy volunteers (p=0.000). In all three groups, the degree of perceived stress, anxiety and depression was at similar level in the women and the men (Figure 2). Although, the men expressed anger more commonly, this was not at a statistically significant level (p>0.05). Those in HV group had lower rates of anxiety and depressive symptoms in comparison to the individuals with MS and HCP (p=0.000), whereas MS and HCP group stated similar anxiety and depressive symptoms (p=0.092, p=0.256; respectively). On the other hand, healthy volunteers stated that they experienced more psychological distress than the persons with MS and healthcare professionals (p=0.000 and p=0.000, respectively) (Table 3) but persons with MS had declared more stressful days. Also, HVs reported more physical problems than MS and HCP groups (Figure 3). Persons with MS were the ones more severely enraged by pandemic conditions.

Quarantine experience did not significantly affect the level of distress experienced by individuals in all three groups. Those quarantined for Covid-19 positivity reported more psychological distress than those not quarantined in all study groups, but this was not at a significant level (Table 4). Severity of psychological distress, days spent with distress and frequency of physical problems were similar between those quarantined and not quarantined. The sole exceptions were that quarantined HVs were more anxious and HCPs had more stressful days (Table 4).

In each group the intensity of post-traumatic symptoms showed a strong and significant relationship with the severity of subjective distress. The greater was the distress, the more severe was

the depressive symptoms and anxiety in MS and HV groups. In HCP group, anxiety and anger did not showed any correlation with impact of events (Table 5 a, b,c).

Conclusion

Pandemic outbreak have caused different experiences in all segments of society. In the previous epidemic periods, being away from loved ones, limited freedom, and the unknowns of the disease had dramatic effects on individuals. In studies evaluating the psychological symptoms experienced by quarantined people, it has been reported that depression, restlessness, insomnia, post-traumatic stress symptoms, anger, and burnout symptoms are experienced intensely.[25] Some prequarantine predictors might affect psychological well-being, however there is mixed evidence for the impact of these predictors. Taylor[26] claims younger age, lower levels of formal educational qualifications, female gender and having one child as opposed to no children as features associated with negative psychological impact. However, Hawryluck[27], report that demographic factors such as marital status, age, education, living with other adults, and having children were not associated with psychological outcomes. We could not detect any significant association of perceived stress level with socio-demographic factors. Those persons with MS living in rural areas had more re-experiencing and hyper-arousal and healthy volunteers an avoidance behavior. Relatively more close relations in the countryside may lead to closer contact with more individuals. The opportunity to be able to share their thoughts, feelings, fears and concerns might have triggered re-experiencing and hyper-arousal in persons with MS nervous about pandemic conditions. Whereas, significantly high avoidance behavior of healthy volunteers living in rural areas may be considered as a reflection of excessive fear and anxiety.

Concerns about Covid-19 was different in all groups. The most obvious concern of HCW's that stood out was transmitting the infection to the family members. HCWs were on the front lines of the crisis under the pressure of not knowing when the outbreak will be under control; grappling both with the diagnosis and treatment of symptomatic patients and asymptomatic carriers of the infection but also with their own heightened risk of contagion. Heavy workload, fear of contracting the disease or transmitting it to the family and lack of staff support systems are the complaints that have been cited in previous studies.[28] Heightened exposure and risk of contagion due to their occupational roles and the lack of regulations where the HCPs asymptomatically carrying Covid-19 may live might be the most important reason leading concerns about family health. That's why about a quarter of HCPs left their homes during this period as a preventive measure.

People with MS have to cope with both disease-related and daily life-related problems which are important factors for heightened stress for them. The risk of exacerbation of the disease with stressful life events have been proven in previous research.[29] The risk of serious infection in individuals with MS is four times higher than in the general population.[30] In addition to the disability caused by the disease, immunomodulatory drugs used make these individuals more prone to infections. These factors may explain why people with MS were more uneasy about contracting Covid-19. However only 5% of the individuals with MS in this study sample were hospitalized due to Covid-19. One reason why the rates were so low may be that they followed the general precautions more because they were too worried about contracting the disease.

One of the restrictions that governments have implemented to contain the spread of Covid-19 virus has been the shutdown. Public sector employees with a regular income and social security may not care much about shutdown, however, for those not having these opportunities and for self-employed workers it may be a crown of thorns. In our sample of healthy volunteers an important portion was working in blue-collar jobs. This may explain much more concern about economic and/or job loss in this group.

In this study, quarantine, contracting the disease and close contact with someone who has the disease were higher in healthcare professionals who were fighting the pandemic in the forefront due to

[25] Brooks et al., 2020.
[26] Taylor et al 2008.
[27] Hawryluck et al 2004.
[28] Carmassi et al., 2020; Jalili et al., 2021.
[29] Altunan et al., 2021.
[30] Montgomery et al., 2013.

their duties. Again, hopelessness and loss of interest were found to be higher in the healthcare professionals. Healthy volunteers and individuals with MS had similar rates of quarantine, contracting the disease, and close contact with someone who had the disease. However, hopelessness and loss of interest were the emotions densely experienced in both groups.

Limcaoco[31] reported that there was no difference in the level of anxiety, grief and perceived stress experienced due to Covid-19 in healthcare professionals and the general population. In another study, it was reported that post-traumatic stress symptoms were more severe in healthcare professionals, they exhibited more avoidance behavior, they were more sad, fearful, hopeless and angry, and felt lonelier.[32] Our findings support this, and the stress, anxiety, grief and anger experienced by healthcare professionals were found to be significantly higher than the general population.

The symptoms of post-traumatic stress disorder and the degree of being affected by the event were also higher in individuals with MS than in other groups. However, these values did not differ statistically when compared with healthcare professionals. Again, the perceived stress level and the components of re-experiencing events, avoidance, and hyperarousal were higher in MS and healthcare professionals than in healthy volunteers. Depression, anxiety, and anger scores were also higher than healthy volunteers. These findings support that individuals with MS experience more psychological distress under pandemic conditions and need more psychological support. Although healthy volunteers had lower event exposure scores, greater degree of psychological distress on the K-10 test may be associated with economic/job loss and uncertainties about the lockdown process.

Limcaoco[33] reported that anxiety, grief, and perceived stress were higher in women, youth, and students. In our study, the degree of perceived stress, anxiety and depression were higher in women in all three groups but was not at a significant level. On the other hand, the psychological distress and anger experienced in men were higher. This difference in affect may be due to biological reasons as well as social roles and responsibilities assumed.

As a result, individuals with MS experienced intense anxiety, depression, anger and stress during the COVID-19 epidemic, regardless of age, education, income level and living environment. It is also noteworthy that individuals with MS were as anxious, dejected and showed more post-traumatic symptoms as healthcare professionals who are at high risk in all tests. It has been reported that quarantine or closure may lead to long-term behavioral changes.[34] In a study conducted on healthcare professionals, it was found that the severity of post-traumatic symptoms, depression, anxiety and perceived stress levels were higher even one year after the epidemic in those working at high risk during the epidemic.[35] It should not be neglected that individuals with MS, who have been affected by the Covid-19 epidemic as intensely as healthcare professionals, should be followed up in terms of long-term depression, anxiety, anger and post-traumatic stress, and the psychological support they will need.

[31] Limcaoco et al 2020.
[32] Brooks et al., 2020.
[33] Limcaoco et al 2020.
[34] Brooks et al., 2020.
[35] McAlonan et al., 2007.

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Table 1. Socio-demographic characteristics of persons with multiple sclerosis (MS), healthcare professionals (HCP) and healthy volunteers (HV).

	MS (63)	HCP (59)	HV (99)	X^2 (p)
Age, year*	37.60±11.69	29.26±7.39	39.6±11.18	102.73 (0.060)
Sex (female) (%)	66.7	67.8	39.4	17.088 (**0.000**)
Education (%)				
Elementary	-	-	4.0	
Intermediate	39.7	8.5	3.0	49.528 (**0.000**)
High school	27.0	27.1	35.4	
University	33.3	64.4	57.6	
Residential location (%)				
Village	6.1	6.1	3.7	8.928 (0.063)
County	26.5	3.0	14.8	
City	69.4	90.9	81.5	
Marital status (%)				
Single	31.6	46.5	31.0	6.802 (0.147)
Married	63.2	53.5	59.8	
Widowed	5.3		9.2	
People living with participant in a household (*)	3.37±1.16	2.55±1.20	3.05±1.31	13.319 (0.346)
Personal monthly income ($x10^3$) (*)	3.4±2.86	6.08±2.4	5.07±4.37	49.080 (0.072)

*Comparison with One-way ANOVA; F(p)

Table2. Summary of Covid-19 experience

Due to Covid-19:	MS n(%)	HCP n(%)	HV n(%)	X^2 (p)
Hospitalization	3 (4.8)	10 (17.2)	13 (13.1)	4.811(0.090)
Quarantine	13 (20.6)	23 (39.0)	28 (28.3)	8.082 (0.089)
Positivity	14 (22.2)	24 (40.7)	28 (28.3)	4.771 (0.092)
Work with a positive one	21 (33.3)	48 (81.4)	42 (42.4)	32.472 (**0.000**)
Getting away from home	3 (4.8)	14 (23.7)	6 (6.1)	15.389 (**0.000**)
Death of a family member/relative	2 (3.2)	3 (5.1)	11 (11.1)	4.087 (0.130)
Hopelessness	24 (38.1)	45 (76.3)	47 (47.5)	21.550 (**0.000**)
Loss of interest	14 (22.2)	28 (47.5)	28 (28.3)	11.791 (**0.019**)
Job/income loss	11 (17.5)	5 (8.5)	41 (41.4)	11.898 (**0.003**)

Table 3. Summary of perceived and experienced psychological distress, depression, anxiety and anger in persons with multiple sclerosis (MS), healthcare professionals (HCP) and healthy volunteers (HV)

	MS	HCP	HV	F (p)
PTSB	22.67±13.78	20.44±14.11	14.01±10.21	10.619 (0.000)
IES	26.70±19.86	22.34±15.13	15.38±13.94	10.003 (0.000)
Re-experience	8.89±7.92	7.10±6.38	5.04±5.67	6.768 (0.001)
Avoidance	10.56±7.40	9.36±4.85	7.42±6.27	5.061 (0.007)
Hyperarousal	7.25±6.24	5.84±5.16	2.93±3.84	15.857 (0.000)
K-10	35.69±10.52	36.07±8.97	43.35±8.21	18.331 (0.000)
PHQ9	9.87±6.08	8.76±5.49	4.69±4.75	21.153 (0.000)
GAD7	6.00±4.87	4.3±3.81	2.17±3.43	11.194 (0.001)
Trait-anger (TA)	20.88±6.49	19.06±5.54	16.02±4.74	9.918 (0.000)

Table 4. Perceived and experienced psychological distress, depression, anxiety and anger in persons with multiple sclerosis (MS), healthcare professionals (HCP) and healthy volunteers (HV) according to being quarantined or not.

	MS			HCP			HV		
Quarantined	No	Yes	p	No	Yes	p	No	Yes	p
PTSD	21.48±13.14	27.23±15.75	0.169	18.80±13.02	22.83±15.54	0.387	12.45±7.66	17.89±14.22	0.135
IES	26.06±19.96	29.15±20.05	0.677	21.28±12.57	23.87±18.44	0.969	13.90±12.51	19.14±16.66	0.137
Re-experience	8.48±7.87	10.46±8.23	0.442	6.28±4.79	8.29±8.13	0.637	4.35±5.15	6.78±6.62	0.069
Avoidance	10.34±7.44	11.38±7.46	0.831	9.60±4.61	9.00±5.25	0.453	6.98±6.14	8.54±6.56	0.314
Hyperarousal	7.24±6.35	7.31±6.03	0.764	5.31±4.61	6.62±5.88	0.472	2.58±3.36	3.82±4.80	0.301
K-10	36.28±10.14	33.46±12.02	0.354	37.54±7.99	33.92±10.03	0.177	44.21±7.20	41.18±10.19	0.057
Severity	3.57±1.12	3.08±1.04	0.133	3.71±1.10	3.29±1.33	0.245	3.97±0.99	3.5±0.96	**0.034**
Day	6.04±9.86	4.31±6.21	0.910	2.71±7.14	4.71±5.10	**0.008**	1.89±4.55	1.86±4.69	0.767
PP	3.80±1024	3.38±1,32	0.281	4.5±0.66	3.79±1.41	0.096	4.77±0.69	4.46±1.10	0.132
PHQ9	10.04±6.15	9.23±6.01	0.659	7.83±4.75	10.12±6.27	0.185	4.34±4.16	5.57±5.99	0.455
GAD7	5.44±4.39	6.90±5.68	0.660	4.00±3.24	4.67±4.50	0.873	1.60±2.66	3.33±4.46	**0.020**
Trait-anger	19.69±4.71	22.80±8.57	0.586	17.94±4.93	20.40±6.09	0.307	16.07±4.50	15.93±5.28	0.572

Table 5a. Correlation of PTSB scores with severity of subjective distress, level of psychological distress, depression, anxiety and anger in MS group. (First row is the correlation coefficient (r), and second row is p value)

	PTSB	IES	IES-R	IES-A	IES-H	K10	PHQ-9	GAD-7
PTSB	-							
IES	0.810	-						
	0.000							
IES-R	0.787	0.950	-					
	0.000	0.000						
IES-A	0.671	0.871	0.699	-				
	0.000	0.000	0.000					
IES-H	0.784	0.944	0.925	0.700	-			
	0.000	0.000	0.000	0.000				
K-10	0.692	0.660	0.706	0.452	0.664	-		
	0.000	0.000	0.000	0.000	0.000			
PHQ-9	0.775	0.725	0.659	0.626	0.729	0.645	-	
	0.000	0.000	0.000	0.000	0.000	0.000		
GAD-7	0.757	0.681	0.703	0.440	0.762	0.505	0.683	-
	0.000	0.000	0.000	0.025	0.000	0.008	0.000	
TA	0.362	0.417	0.497	0.242	0.427	0.146	0.194	0.642
	0.069	0.034	0.001	**0.234**	0.003	**0.478**	**0.341**	0.001

IES-R: re-experiencing; IES-A: avoidance; IES-H: hyperarousal

Table 5b. Correlation of PTSB scores with severity of subjective distress, level of psychological distress, depression, anxiety and anger in HCP group.

	PTSB	IES	IES-R	IES-A	IES-H	K-10	PHQ-9	GAD-7
PTSB	-							
IES	0.866	-						
	0.000							
IES-R	0.842	0.952	-					
	0.000	0.000						
IES-A	0.666	0.862	0.711	-				
	0.000	0.000	0.000					
IES-H	0.860	0.943	0.988	0.710	-			
	0.000	0.000	0.000	0.000				
K-10	0.521	0425	0.406	0.249	0.488	-		
	0.000	0.001	0.001	**0.058**	0.000			
PHQ-9	0564	0.553	0.482	0.458	0.573	0.559	-	
	0.000	0.000	0.000	0.000	0.000	0.000		
GAD-7	0.539	0.298	0.307	0.077	0.400	0.589	0.700	-
	0.001	**0.093**	**0.082**	**0.670**	0.021	0.000	0.000	
TA	0.341	0.278	0.271	0.177	0.297	0.432	0.499	0.422
	0.052	**0.117**	**0.128**	**0.323**	**0.093**	0.012	0.003	0.014

IES-R: re-experiencing; IES-A: avoidance; IES-H: hyperarousal

Table 5c. Correlation of PTSB scores with severity of subjective distress, level of psychological distress, depression, anxiety and anger in HV group.

	PTSB	IES	IES-R	IES-A	IES-H	K-10	PHQ-9	GAD-7
PTSB	-							
IES	0.587	-						
	0.000							
IES-R	0.779	0.911	-					
	0.000	0.000						
IES-A	0.597	0.859	0.609	-				
	0.000	0.000	0.000					
IES-H	0.821	0.879	0.836	0.585	-			
	0.000	0.000	0.000	0.000				
K10	0.536	0.419	0.423	0.228	0.525	-		
	0.000	0.000	0.000	0.023	0.000			
PHQ-9	0.667	0.533	0.507	0.339	0.632	0.660	-	
	0.000	0.000	0.000	0.001	0.000	0.000		
GAD-7	0.747	0.616	0.555	0.441	0.726	0.680	0.822	-
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TA	0.547	0.566	0.548	0.417	0.587	0.435	0.530	0.522
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

IES-R: re-experiencing; IES-A: avoidance; IES-H: hyperarousal

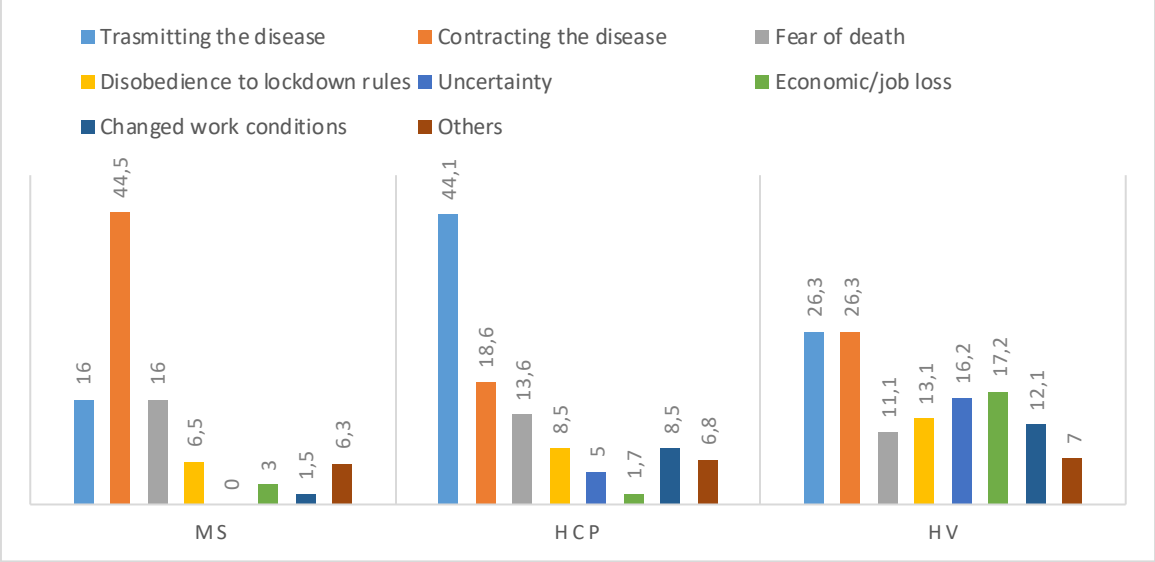

Figure 1. Concerns about the COVID-19 outbreak in persons with MS, healthcare professionals (HCP), and healthy volunteers (HV)

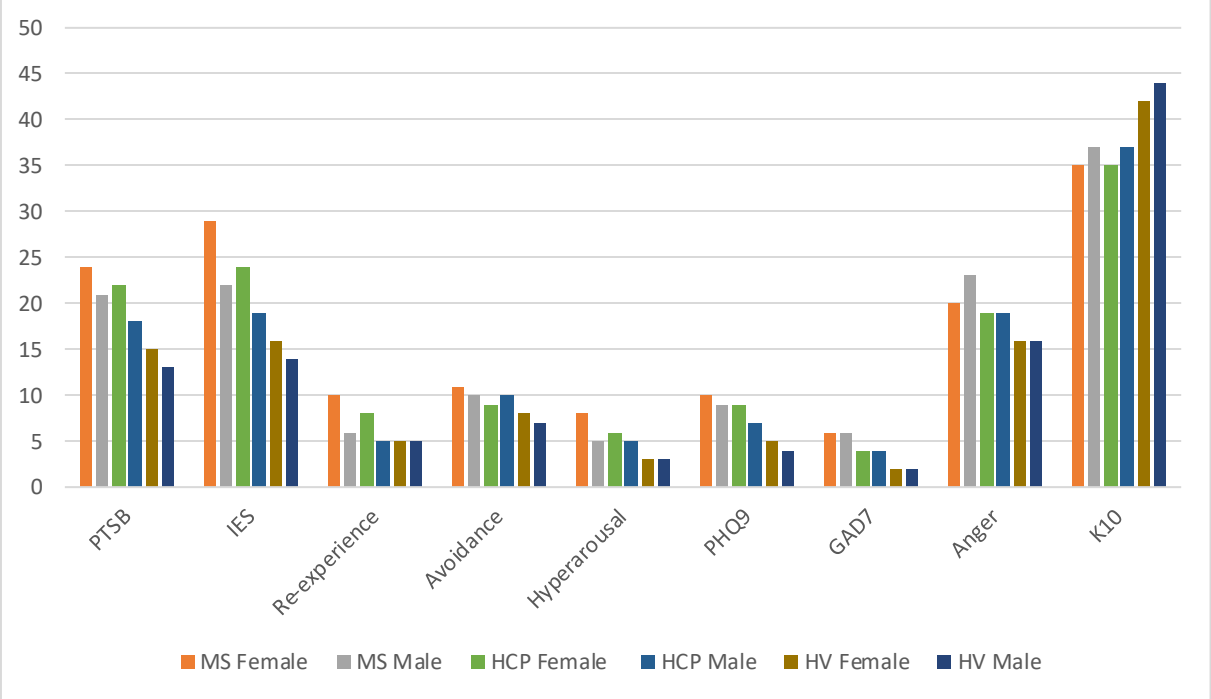

Figure 2. Distribution of the scores on the scales in groups by sex

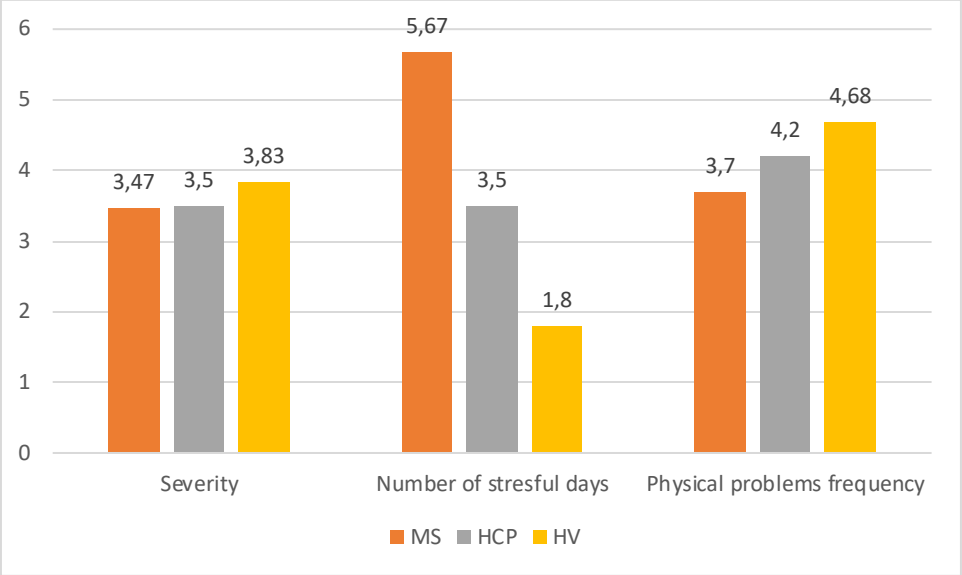

Figure 3. Psychological distress severity, number of stressful days and physical problems frequency in MS, HCP and HV groups.