ORIGINAL ARTICLE

Psychoeducation and Relaxation Decrease Stress Levels in COVID-19 Patients

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ABSTRACT

Introduction: Stress has been reported in patients with COVID-19. The current study aims to determine the effect of psychoeducation and relaxation psychotherapy on the stress and adrenaline levels of COVID-19 patients at the Sebelas Maret University (UNS) Hospital. **Methods:** A quasi-experimental study with the criteria of moderate COVID-19 patients,willing to take part in the study were selected. The research subjects consisted of 28 individuals divided into two groups, the treatment group and the control group. The stress level in COVID-19 patients was measured using the Perceived Stress Scale (PSS), while the adrenaline level was measured using the ELISA. The statistical test used the paired t-test or Wilcoxon test and independent t-test or Mann Whitney test. **Results:** The study shows a significant decrease in PSS of the treatment groups (11.36±5.65 to 7.93±4.75; p=0.012). There was a decrease in PSS of the control group, but it was not statistically significant (12.85±4.69 to 11.15±4.68; p=0.085). The adrenaline levels increased in both the treatment and control groups, but they were not statistically significant. The adrenaline levels of the control group were 8.28±5.18 pg/mL to 8.75±4.87 pg/mL (p=0.794) and 9.87±5.87 pg/mL to 9.92±4.77 pg/mL (p=0.986) in the treatment group. **Conclusion:** The current study shows that combination psychoeducation and relaxation decrease the stress levels (PSS score) of COVID-19 patients at the UNS Hospital.

Keywords: Psychoeducation, relaxation, perceived stress scale, adrenaline, COVID-19

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INTRODUCTION

COVID-19 (coronavirus disease 2019) has been around for more than a year in Indonesia. COVID-19 is a global health problem that affects many sectors of life. The scale of the impact of COVID-19 is immense, and research suggests it may take more than a decade for the world to recover its' health, social, and economic sectors (1). In August 2021, in Indonesia, there were 3,462,800 cases of COVID-19 with 523,162 active cases. The condition proved that COVID-19 is a serious problem in Central Java as the mortality rate in the province was high (2). The current pandemic caused by COVID-19 is creating unique distress for patients with the disease. There is a need to broadly discuss the emotional and psychological burdens that patients with COVID-19 may suffer, not to mention there is a need for a psycho-educational approach that can mitigate the impact and adverse outcomes caused by such burdens (3). Researches show that the number of COVID-19 deaths is increasing in patients with mental disorders (4).

Infection can cause a disruption of the immune system that leads to psychiatric or psychopathological disorders, which occur in COVID-19 patients (5). There are two things that can cause psychological stress on COVID-19 patients. The first one is psychological conditions caused by social isolation, a severe incurable disease, fear of the possibility of infecting others, especially family, and social stigma that regards it as a disgrace. The second is the immune reaction of COVID-19. The COVID-19 immune response induces local and systemic production of cytokines, chemokines, and other inflammatory mediators. In the presence of COVID-19, the cytokines produced by helper T cells 1 and 2 will increase. The more cytokines, the more severe the disease is. Several cytokines are associated with psychiatric disorders such as interleukin-6. In addition, inflammation of nerves, breach of the blood-brain barrier, invasion of immune cells into the central nervous system, impaired nerve transmission, dysfunction of the hypothalamic-pituitary-adrenal (HPA) axis, and activation of microglia and indoleamine 2,3-dioxygenase (IDO) play a role in psychopathological mechanisms (5).

Data from cohort studies showed that patients with COVID-19 are indicated with high levels of anxiety, depression, and stress (5). Stress can be defined as a condition where the demands exceed the existing capabilities of the object. Stress manifests itself not just at the organism level but also at the organ and cellular

levels. Stress is a type of bodily reaction that decides whether or not life will continue. Stress hormones are released in modest amounts throughout the day in normal conditions, but when faced with stress, their levels will rise rapidly (6). The mechanisms by which COVID-19 causes psychiatric disorders include the virus's direct effect on the current nervous system, inflammation of the central nervous system, and whole-body system. The other mechanism is the psychological impact of the environment, the stigma of infectious diseases, disruption of social roles, and dysfunction due to illness afflicted. This neuropsychiatry does not always occur in the majority of COVID-19 patients. Altered mental status (delirium) is the most frequent neuropsychiatric symptom in the patients (7).

The adrenal glands produce the adrenaline or noradrenaline hormone by the medulla adrenal when there are stressors outside the body. Adrenaline is formed from noradrenaline methylation by the phenylethanolamine N-methyltransferase (PNMT) enzyme. This enzyme can only be found in the brain and medulla adrenal. Glucocorticoids induce PNMT (8). The Perceived Stress Scale (PSS-10) is one of the most frequently used tools for measuring perceived stress. This tool measures the level of stress in a person's life. Initially, the PSS was developed by Cohen et al. and consisted of 14 items (PSS-14) (9). However, the items were later reduced to 10 items (PSS-10), omitting four items based on the results of the main material analysis (10).

Psychoeducation is a type of tutoring in an integrative model regarding diagnosis, therapy, disease course, and prognosis. Psychoeducation is given as a whole from various points of view. Relaxation psychotherapy is an interpersonal relational intervention used by psychotherapists to help patients or clients deal with life's problems by relaxing in silence to achieve moments of inner peace in depth. Management of psychoeducation and relaxation psychotherapy is expected to reduce stress and cortisol hormone levels. Besides that, it will indirectly improve disease symptoms by lowering the stress levels and accelerating the COVID-19 patients's recovery.

Psychoeducation and relaxation psychotherapy have only been studied in small numbers in COVID-19 patients. This study aims to determine the effect of psychoeducation and relaxation psychotherapy on the stress and adrenaline levels of the COVID-19 patients at the Sebelas Maret University Hospital (UNS).

MATERIALS AND METHODS

Subject recruitment

The study population was COVID-19 patients at the UNS Hospital during the period May-September 2020 with inclusion criteria like age between 18-64 years, with mild and moderate clinical symptoms, can operate handphones, and willing to take part in the study. Exclusion criteria are those with a history of chronic disease (diabetes, chronic lung disease, cardiovascular disease, and chronic renal disease), pregnant women, and in steroids treatment. The sampling technique used in this study was random sampling (1:1 each group), with a total of 28 COVID-19 patients enrolled in this study. This study has received ethical approval from the Health Research Ethics Committee based on letter number 1/01 / HREC / 2021.

Psychoeducation and relaxation psychotherapy protocol

The current study was carried out by providing psychoeducation by a psychiatrist and relaxation psychotherapy for ten consecutive days (Table I). This study used a psychoeducation therapy setting and individual progressive muscle relaxation. This therapy was carried out using telemedicine. Psychoeducation was aimed to help the patients understand the diagnosis, treatment, course of the disease, and prognosis better. Individual psychoeducation provided an overview of the psychological evaluation process and intervention planning to reduce biological, social, and psychological factors. The harmonization of physical, psychological, and social factors can help individuals manage disease-related conditions and face life's challenges. The technique of giving psychoeducation was by using audio visiual media and discussions via WhatsApp. Slides were made pertaining to accounts of psychoeducation for clients explaining COVID-19. Psychoeducation using slide as learning media was considered the best method for the individuals to carry out the learning interactions. Psychoeducation was combined with progressive muscle relaxation therapy with the hope of relieving tensions so that the individuals can relax, relieve anxiety, stress, or other physical disorders. Relaxation is a form of muscle training to reduce stress. A progressive relaxation method focuses on muscular activation by detecting tight muscles and subsequently relaxing them using relaxation techniques to achieve a sense of tranquility. Progressive relaxation has been frequently used for stress management.

Table 1: Implementation Stage

Stage	Activities
Session 1	Building Rapport, Informed Consent and Pre-Tests
Session 2	Psychoeducation Session 1
Session 3	Progressive Relaxation Technique Session 1
Session 4	Psychoeducation Session 2
Session 5	Progressive Relaxation Technique Session 2
Session 6	Psychoeducation Session 3
Session 7	Progressive Relaxation Technique Session 3
Session 8	Psychoeducation Session 4
Session 9	Progressive Relaxation Technique Session 4
Session 10	Evaluation

10-item Perceived Stress Scale (PSS-10)

PSS-10 is a 10-item self-report tool to assess "how unpredictable, uncontrollable, and overloaded respondents found their lives." Each item is rated on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). The PSS-10 consists of six positive items (items 1, 2, 3, 6, 9, and 10: positive aspects) and four negative items (items 4, 5, 7, and 8: negative aspects). The total scores range from 0 to 40, with lower scores indicating lower levels of perceived stress (11).

The Perceived Stress Scale (PSS-10) instrument by Cohen et al., (1983)(9) has been declared valid and reliable with a Chronbach Alpha coefficient of 0.85. For PSS-10 in the Indonesian Language by Pin, 2011 with 63 participants in the research were previously tested with a Chronbach Alpha coefficient value of 0.96.

Adrenaline

The Epinephrine ELISA Kit is available from ABNOVA, Catalog Number KA1882. Adrenaline (epinephrine) is isolated, acylated, and then transformed enzymatically using a cis-diol-specific affinity gel. The microtiter plate format is used in the competitive ELISA kit. The antigen is attached to the microtiter plate's solid phase. The solid phase wraps analytes, derivatized standards, controls, and samples. All compete for a limited number of antibody binding sites. To eliminate free antigen and free antigen-antibody complexes the solution is washed once the system has reached equilibrium. An anti-rabbit IgG-peroxidase combination utilizing TMB as a substrate detects the antibody attached to the solid phase. At 450 nm, the reaction is observed. The absorbance of unknown materials is compared to a reference curve produced with known standard concentrations to determine their quantity.

Statistical analysis

Demographic data were presented as descriptive (means and standard deviation). Different test using independent T-test or Mann Whitney was performed on variables between the control and treatment groups. Paired T-test or Wilcoxon test was carried out in each group to compare the before and after treatment. The P is significant if p is less than 0.05

RESULTS

This study involved 28 research subjects. Table II shows that the data on stress levels in the COVID-19 patients at UNS Hospital were low (PSS-10 stress scale 0 to 13). While the adrenaline levels were below the normal range (18 pg/mL), which means there was a low adrenaline concentration in the COVID-19 patients. The low adrenaline concentration in COVID-19 patients is also found in the previous studies that show central adrenal insufficiency in COVID-19 patients (12).

This study shows that both the control group and the group receiving psychoeducation along with relaxation psychotherapy had a reduction in the stress levels as measured at the baseline and after the 10th day of treatment. However, it turned out that the reduction in stress levels in the control group was not statistically significant (PSS score from 12.85 ± 4.69 to 11.15 ± 4.68; p = 0.085), while the treatment group showed that psychoeducation and relaxation psychotherapy had an improvement in the stress level (PSS score from 11.36 ± 5.65 to 7.93 ± 4.75; p = 0.012) (Figure 1).

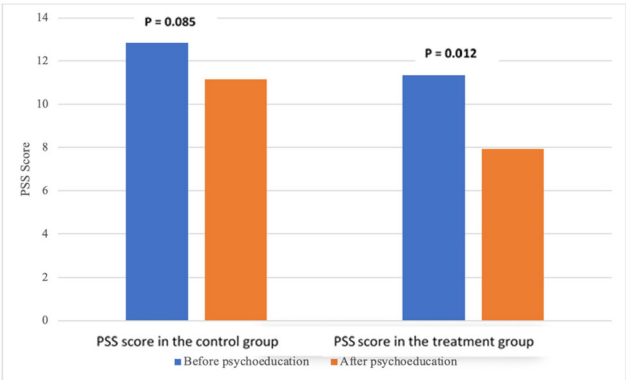

Figure 1: The difference in PSS score before and after psychoeducation

Table II: Demographic description of research subjects.

Variable	Control Group	Treatment Group	Total	*p*-Value
Age (years old), Mean ± SD	35.79 ± 14.25	37.93 ± 11.97	36.86 ± 12.96	0.670
Sex			28	0.127
-Male	6	8	12	
-Female	12	4	16	
PSS score before psychoeducation	12.85 ± 4.69	11.36 ± 5.65	12.07 ± 5.17	0.465
PSS score after psychoeducation	11.15 ± 4.68	7.93 ± 4.75	9.48 ± 5.37	0.121
The difference in PSS score before and after psychoeducation	1.69 ± 3.25	3.43 ± 4.38	2.59 ± 3.91	0.256
Adrenaline before psychoeducation	8.28 ± 5.18	9.87 ± 5.87	9.08 ± 5.49	0.456
Adrenaline after psychoeducation	8.75 ± 4.87	9.92 ± 4.77	9.34 ± 4.77	0.527
The difference in Adrenaline before and after psychoeducation	-0.47 ± 6.54	-0.5 ± 4.83	-0.26 ± 5.64	0.850

The adrenaline levels in both the control and treatment groups were low, and there was an increase in the adrenaline levels in both groups. The control group's adrenaline levels increased more than the treatment group, from 8.28 ± 5.18 pg/mL to 8.75 ± 4.87 pg/mL with p = 0.794. On the other hand, the treatment group's adrenaline levels increased from 9.87 ± 5.87 pg/mL to 9.92 ± 4.77 pg/mL (p = 0.968). Although there was an improvement in the adrenaline levels, it was not statistically significant (Figure 2).

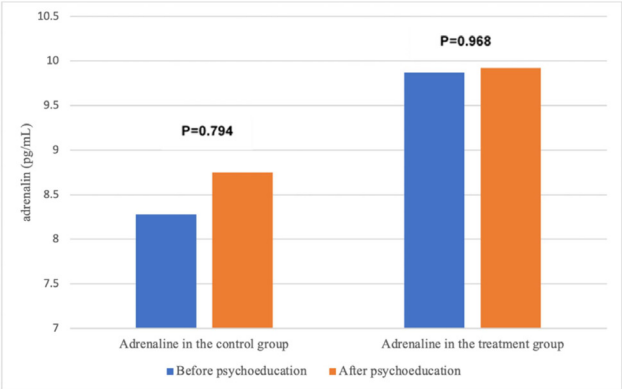

Figure 2: The difference in adrenaline before and after psychoeducation. pg/mL=picogram/mililittres

DISCUSSION

This study was the first study examining the benefits of psychoeducation and relaxation psychotherapy for hospitalized COVID-19 patients. The result shows the stress levels of COVID-19 patients can be reduced with psychoeducation and relaxation psychotherapy treatment. The adrenaline levels tend to increase, but in the control group there was a higher increase even though not statistically significant. The low adrenaline level in this study is a matter of discussion regarding the pathogenesis of COVID-19.

Stress is primarily a physical response. When under stress, the body thinks it is under attack and switches to 'fight' or 'flight' mode that induces the pituitary gland in the brain region. Then the pituitary gland secretes endocrine hormones into the blood. This hormone activate the hormones adrenaline and cortisol so that the body can adapt to the changes that occur. Naturally, in this condition, the heart beats faster and the individual will feel cold sweat flowing in the nape area. Also, increased blood flow to the skeletal muscles and decreased blood flow to the kidneys, skin, and digestive tract can also occur due to stress. Stress conditions that make the body produce adrenaline make the heart work harder and faster (12). The medulla adrenal of adrenal glands produce adrenaline or noradrenaline hormone when the body is under stress. Adrenaline is formed from noradrenaline methylation by the phenylethanolamine N-methyltransferase (PNMT) enzyme, which can only be found in the brain and medulla adrenal and glucocorticoids induced PNMT. Under normal circumstances, adrenaline levels are below 50 Pg/ml. In the adrenaline free state of 18 pg/ml, the blood's adrenaline levels will be zero when adrenalectomy is performed. In conditions of extreme stress, the level of adrenaline in the blood increases up to 300 times than normal, depending on the type and intensity of the stimulus (8).

The psycho-educational approach plays a vital role in providing information and knowledge about the COVID-19 disease, including the clinical symptoms suffered by COVID-19 patients and it has various side effects like body ache. This development strategy is essential as it is needed to provide psychosocial support to COVID-19 patients so that the patients will have a feeling of independence in life to manage their disease (13). Psychoeducation can be used in various settings such as clinical psychology, education, work, and in the world of medicine. For example, in medicine, psychoeducation can be applied to patients with common medical disorders such as COVID-19. Psychoeducation is an intervention that focuses on education, helping participants to develop sources of mental support and social support also to develop coping skills to face those challenges (14).

One of the manifestations in COVID-19 patients that often occurs and often goes unnoticed is stress during the treatment. Several factors such lack of time in the hospital workers, excessive fear of COVID-19, health workers using proper PPE kit, and direct effects of the disease such as the increase in cytokine (interleukin 6) are directly related to psychological distress in COVID-19 patients undergoing isolation treatment in hospitals. This condition becomes stressful and increases the stress level in the COVID-19 patients. Distress can be defined as a condition where the demands that must be met exceed the objects existing capabilities. Stress occurs at the organism, organ, and cellular levels (8). Stress increases CRF, CRF increases ACTH, and ACTH causes the release of the cortisol hormone from the adrenal glands. Cortisol circulates in the body and plays a role in the coping mechanism. If the stressor received by the hypothalamus is large, the secretion of CRF will increase so that the stimulation obtained by the pituitary also increases, and the secretion of cortisol by the adrenal glands also increases. When the emotional state has stabilized, the coping become positive, then a signal in the brain will inhibit the release of CRF, and the stress hormone cycle repeats itself. In conditions of psychological distress, the secretion of cortisol increases. Stress is a significant factor in causing relapse in all addictions (8,14).

The role of ACTH in the secretion of cortisol occurs through the interaction of the components contained in the hypothalamic-pituitary (HPA) axis. The secretion of ACTH by the anterior pituitary will bind to its receptors on the adrenal cortex cell membrane. For this,

extracellular calcium ions are needed. Furthermore, this bond will activate the adenylyl cyclase, cAMP, and protein kinase-A enzymes to change cholesterol esterase to free cholesterol. ACTH activates adrenal cortex cells to produce corticosteroids (6). Interleukin-6 causes activation of the HPA Axis. The increased proinflammatory cytokines are associated with the decreased synthesis of monoamines. IL-6 will increase the activity of IDO, which plays a role in the catalysis of tryptophan, thereby activating the kynurenine pathway and reducing central serotonin availability. The agonist quinolinic, N-methyl-D-aspartate glutamic acid (NMDA), and 3-hydroxykynurenine will increase. As a result, oxidative stress is increased, contributing to neurodegeneration resulting in psychological distress (15).

Low adrenaline level in the current study is cricial regarding the pathogenesis of COVID-19. Previous research shows that in patients with COVID-19, there is interference from the pituitary hypothalamus and adrenal axis. This study shows an impaired adrenocortical response to COVID-19 caused by a decrease in the secretion of ACTH in the brain of the COVID-19 patients (10). One of the reasons it happens is that the coronavirus can affect the hypothalamus and pituitary gland. A study shows that out of 63 patients infected with SARS, 40% had a central adrenal insufficiency three months after recovering (16). The SARS virus also has another mechanism to block the stress response by expressing several amino acids similar to ACTH, resulting in ACTH deficiency and secondary adrenal insufficiency in COVID-19 patients (17).

The limitations of the present study remain in the fact that there were small number of patients, only in one centre, Multicentre follow-up study is needed to be carried out with a large number of patients. The other limitations were the severity of the disease and the cognitive abilities of each patient were not included in the study. Also, the interview technique was based on telemedicine that is different from a direct interview.

CONCLUSION

The present study showed that psychoeducation and relaxation psychotherapy could decrease stress levels in the COVID-19 patients at the UNS Hospital. Further research with more participants and a multicentre approach is needed to generalize the study outcome to determine the effects of psychoeducation and relaxation psychotherapy in managing COVID-19 patients.

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