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Comparison of the Effectiveness of Emotion-Focused Cognitive-Behavioral Therapy (ECBT) and Mindfulness-based Cognitive Therapy (MBCT) on C-Reactive Protein (CRP) Level in Patients with Psoriasis

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Abstract

Objective: The objective of this study was to compare the effectiveness of Emotion-Focused Cognitive-Behavioral Therapy (ECBT) and Mindfulness-Based Cognitive Therapy (MBCT) on the C-reactive protein (CRP) level in patients with psoriasis.

Method: This research is a quasi-experimental study with a pretest-posttest design, a follow-up period, and control and intervention groups. The statistical population included all patients with psoriasis referring to Skin and Stem Cell Research Center (SSRC), Tehran University of Medical Sciences (TUMS). In this study, 30 patients were selected as the sample and were randomly assigned to the control group (5 males and 5 females), the first intervention group (5 males and 5 females), and the second intervention group (5 males and 5 females). Patients in the first and second intervention groups participated in 8 sessions of ECBT and MBCT, respectively, and subjects in the control group received no intervention and were placed in the waiting list. The pretest, posttest, and follow-up CRP level were measured using laboratory kits. The data were analyzed using the repeated measures ANOVA through SPSS v. 22.

Results: The results showed that both ECBT and MBCT reduced the CRP level equally. The same results were also obtained during the follow-up period.

Conclusion: The study findings suggested that both ECBT and MBCT can be effective treatments for physical, psychological, and biological problems caused by psoriasis.

Keywords: Emotion-Focused cognitive-behavioral therapy, Mindfulness-based cognitive therapy, C-reactive protein, Severity of psoriasis, Psoriasis.

Introduction

Psoriasis is a chronic and non-communicable autoimmune skin disease (Petty *et al*., 2003). Clinical symptoms of this disease include red and scaly skin, especially on external surfaces of joints (e.g., knee and elbow), impact-sensitive lesions, and bulgy and itchy patches (Tunsuriawong, 2003). Psoriasis is a comorbid disease that may affect all body organs, in addition to the skin. Patients with psoriasis are more likely to develop arthritis, cardiovascular diseases, hypertension, obesity, diabetes, and autoimmune diseases (Lau *et al*., 2003). The global prevalence of psoriasis is reported the range between 1% and 3% (Mayers *et al*., 2006). Although there are no exact data on the prevalence of psoriasis in Iran, it is one of the most common skin diseases among Iranians and seems to be more prevalent in northern part of Iran (Dorjani *et al*., 2013). Psoriasis may affect people at any age but mostly occur in people aged between

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15-35 years old (Brown, 2012). The prevalence of this disease is almost the same among men and women (Salman *et al*. 2016).

Inflammation is a key risk factor for early morbidity and mortality, and growing evidence links emotional processes with systemic inflammation. Across clinical and population-based samples, heightened systemic inflammation has been shown to contribute to poor health (e.g., atherosclerosis, Type II diabetes, rheumatoid disease, osteoporosis) and to elicit a number of pathogenic processes (e.g., oxidative stress, insulin resistance, plaque rupture, and endothelial pathology) that play a major role in the risk of premature mortality (Cesari et al., 2003; Epel & Lithgow, 2014; Miller, Chen, & Parker, 2011; Schneiderman, Ironson, & Siegel, 2005). Evidence from human laboratory research suggests that negative emotional states stimulate inflammatory responses (Duivis et al., 2011; Howren, Lamkin, & Suls, 2009; Miller & Blackwell, 2006). For example, avoidance-oriented negative emotions, such as fear and shame, have been linked to greater inflammatory activity (Dickerson, Kemeny, Aziz, Kim, & Fahey, 2004; Moons, Eisenberger, & Taylor, 2010). Similarly, the onset and progression of particular negative moods and traits (e.g., depression, hostility, and anxiety) are often followed by elevated levels of inflammatory proteins, including the pro-inflammatory cytokine interleukin-6 (IL-6), the acute phase C-reactive protein (CRP), and the clotting factor fibrinogen (Ai, Kronfol, Seymour, & Bolling, 2005; Duivis et al., 2011; Miller, Rohleder, Stetler, & Kirschbaum, 2005; Moons & Shields, 2015; Pitsavos et al., 2006; Suarez, 2003).

One of the most important biomarkers of psoriasis is the CRP level (Coimbra *et al*., 2010). CRP is an acute-phase inflammatory protein that is synthesized by hepatic cells and increases in the following interleukin-6 (IL-6) secretion. CRP signals the complement system to destroy other cells of the body (Ridker, 2016). CRP is the best component of the inflammatory syndrome response and the most common index used to identify inflammatory conditions such as infection, inflammatory diseases, and malignancies. The increased CRP level is associated with various chronic inflammatory processes such as some rheumatologic conditions, cancer, and cardiovascular disease (Dhingra *et al*., 2007). The CRP level is less than 3 mg/l in normal individuals and more than 3 mg/l in abnormal individuals. However, a CRP level of more than 10 mg/l is indicative of an underlying inflammatory disease (Dhingra *et al*., 2007). Studies on patients with psoriasis have shown that the high CRP level in these patients exacerbates the symptoms of psoriasis (Coimbra *et al*., 2010; Strober *et al*., 2008; Chodorowska *et al*., 2004). Measurement of the CRP level is one of the prerequisites of psoriasis treatment (Farshchian *et al*., 2016). In a study titled "C-reactive protein level in blood serum of patients with psoriasis before and after treatment with narrow-band ultraviolet B", Ansar *et al*. (2012) showed that the CRP level was very high in psoriasis patients, and the higher the CRP level is, the more severe the skin lesions would be in this patients. They also reported that the high CRP level was associated with systemic inflammation among these patients.

First designed by Suveg (2006), ECBT focuses on skills of identifying one's and others' emotions (emotional awareness), the correct way of emotional expression with regard to social status (emotion understanding), and pre-response reduction of negative emotions (emotion regulation). What matters in emotion-focused therapies is that emotions have inherent adaptive potentials. If these potentials are activated, they can help clients to change their problematic emotional states or unwanted experiences (Greenberg *et al*., 2007). In fact, emotion-focused therapies are modern humanistic and empirical therapies (Greenberg & Geller, 2012). In emotion-focused therapies, the therapist not only focuses on activating the mental

content denied or distorted by the client, but also attempts to provide the client with new meanings influenced by the client's physical experience (Greenberg & Watson, 2006). Psychological therapies, such as ECBT, can be effective in the treatment of problems and conditions caused by psoriasis.

Kabat-Zinn (1982) used mindfulness in psychological therapies for the first time. Mindfulness is a kind of consciousness that is gained through bringing one's attention to experiences occurring in the present moment without judgment (Kabat-Zinn, 1994). Mindfulness-based interventions are considered as one of the third wave cognitive-behavioral therapies (Öst, 2008). MBCT is a kind of short-term group intervention that follows three main objectives: attention regulation, development of meta-cognitive awareness, and acceptance of mental states and contents (Mace, 2008). The main objectives of MBCT include increasing the awareness of body senses and momentary emotions and thoughts, developing different ways of communicating with the senses, thoughts, and feelings (especially unwanted thoughts and feelings that automatically and habitually cause permanent problems), and expressing the subtlest response to unpleasant thoughts, feelings, and situations (Mohammadkhani & Khanipour, 2012). Alibeigi *et al*. (2017), in a study titled "Effect of Mindfulness-Based Stress Reduction Intervention on Physical Symptoms in Patients with Psoriasis", showed that a mindfulness-based stress reduction intervention reduced physical symptoms in patients with psoriasis.

Previous studies have shown the relationship of emotional functions with the CRP level (Appleton *et al*., 2011) and the severity of psoriasis (Almeida *et al*., 2017). Therefore, it is necessary to study the effects of ECBT on patients with psoriasis. Cognitive-behavioral approaches to the treatment of skin diseases emphasize the importance of recognizing the behavioral and emotional reactions associated with skin diseases, the conceptualization of how these reactions relate to the nature and process of skin diseases, and the relationship between these reactions and psychological complications of skin diseases (White, 2001). The present study aims to compare the effects of ECBT and MBCT on the CRP level in patients with psoriasis.

Materials and Methods

This research is a quasi-experimental study with a pretest-posttest design, a follow-up period of two months, and control and intervention groups. The statistical population includes all patients with psoriasis visiting Skin and Stem Cell Research Center (SSRC), Tehran University of Medical Sciences (TUMS).

Participants

In this study, 30 patients were selected as the sample and randomly assigned to the control group (5 males and 5 females), the first intervention group (5 males and 5 females), and the second intervention group (5 males and 5 females). The inclusion criteria were the definitive diagnosis of psoriasis by a specialist, not taking psychiatric drugs during the intervention, being in the age range of 20-50 years, non-affliction with other skin diseases, no history of an effective mental disorder and other physical ailments, not taking psychological treatments over the past three months, no history of smoking or drug abuse, and willingness to participate in the study. In addition, the exclusion criteria included affliction with psychiatric and other physical illnesses that would affect the intervention, being absent more than two sessions during the intervention, smoking or drug abuse, affliction with other skin diseases, taking psychological treatments over the past three months, and reluctance to participate in or continue the study. In order to adhere to the research ethics, the participants were asked to write a consent form.

Measurements

The pretest, posttest and follow-up blood CRP level were measured using a laboratory kit (MININEPH™ HUMAN C-REACTIVE PROTEIN KIT). According to this kit, a CRP level of less than 3.8 mg/l was considered normal.

Interventions

Patients in the first intervention group participated in 8 sessions of ECBT based on Suveg *et al*. (2006) and Dattilio's (2010) models. Table 1 shows a description of these 8 sessions.

Patients in the second intervention group participated in 8 sessions of MBCT. Table 2 presents a description of these 8 sessions.

Participants of the control group received no intervention and were put on the waiting list.

The data were analyzed using descriptive statistics (measures of central tendency and indices of dispersion, frequency distribution tables, and graphs) and inferential statistics (the Kolmogorov-Smirnov test and the Shapiro–Wilk test), given the normal distribution of the data. In addition, the repeated measures ANOVA was employed to compare the variance of experimental groups (because of the follow-up period). All statistical analyses were performed by SPSS-22.

Table 1: A summary of the 8 sessions of ECBT intervention performed for the first intervention group

First session	Establishment of therapeutic communication and initial evaluation; explanation of the intervention rules, objectives, and number of sessions and conclusion of a medical contract (informed consent form); description of the intervention objectives and procedures; introduction of the issues that would lead to patient dissatisfaction, with an emphasis on resolving them; training and focusing on three psychological dimensions (cognition, behavior, and emotion) in relation to itching, inflammation, and other symptoms of psoriasis; completion of pretest questionnaires
Second session	Reviewing the feedback of the previous session and addressing any possible uncertainty or ambiguity; behavioral and communication skills training; encouragement of participants to improve their positive behavioral exchanges and reduce negative one; individual and group punishments related the disease (e.g. understanding the reinforcement patterns); homework assignment
Third session	Reviewing the feedback of the previous session and addressing any possible uncertainty or ambiguity; concentration on expectations, individual living criteria, selective attention and attribution; concentration on cognitive activities, patient-related assumptions; and patient cognitive distortions about the patient-disease relationship (selective inference and abstraction, extreme generalization, personalization, etc.); homework assignment
Fourth session	Reviewing the feedback of the previous session and addressing any possible uncertainty or ambiguity; concentration on coping patterns; concentration on a variety of emotions and emotional training; introduction of emotional reactions associated with the emotions affecting the disease; homework assignment
Fifth session	Training in progressive muscle relaxation and imagination; concentration on emotional schemas, its internal functional patterns in the face of the disease, its relationship with the disease-related cognition and behavior, and the interplay of these three factors; concentration on emotional schemas and their relationship with the disease relapse; homework assignment
Sixth session	Introduction of the physical symptoms of emotions and different types of primary and secondary emotions and encouragement of participants to express their primary emotions and observe their positive cognitive and behavioral outcomes in the patient-disease lifecycle; training in the improvement of emotions tolerance threshold during the disease relapse; identification of cognitive factors affecting the participant's emotional misconceptions
Seventh session	Cognitive reconstruction and its techniques; homework assignment
Eighth session	Reviewing the therapeutic principles and behavioral, cognitive, and emotional skills to prevent the negative emotions affecting the disease; final conclusion with the help of participants

Table 2: A summary of the 8 sessions of MBCT intervention performed for the second intervention group

First session	Explanation of the general policy with respect to the confidentiality of participants' personal life; introduction of participants; automatic guidance; informed eating of a raisin; physical meditation and examination; group formation; homework assignment
Second session	Coping with obstacles and problems; physical meditation and examination; thoughts and feelings practice; homework assignment (10 minutes of breathing and focusing on daily activity in a different way and preparation of a daily report of experiencing a pleasant event)
Third session	Mindful breathing; mindful movement; breathing and stretching exercises, 3-minute breath attempts; homework assignment (breathing and stretching exercises, mindful movement, and 3-minute breath attempts 3 times a day)
Fourth session	Concentration; 5 minutes of visual or auditory presence of mind; sitting meditation with focus on awareness of the body breathing; mindful walking; homework assignment (sitting meditation, 3-minute breathing as a coping strategy)
Fifth session	Acceptance and permission; sitting meditation; awareness of the body and breathing; emphasis on awareness of how to respond to thoughts, emotions, and physical sensations; homework assignment (sitting meditation, 3-minute breathing)
Sixth session	Mindfulness training; concentration on positive and negative or pleasant and unpleasant thoughts; entry of positive and negative thoughts into the mind and easy removal of them without judgment or close attention to them; homework assignment
Seventh session	Self-care training; sitting meditation with full awareness of breathing, body, sounds, thoughts, and emotions; understanding the relationship between activities and moods; homework assignment (selection of a set of different types of exercises for post-course implementation)
Eighth session	The use of skills and techniques learned to cope with future moods; physical meditation and examination; completion of mediation; review of previous sessions; homework assignment (development of a home exercise program)

Results

The demographic information of the participants is shown in Table 3.

The results showed that the mean CRP level in the posttest and the follow-up reduced compared to the pretest in both ECBT and MBCT groups. The pretest, posttest, and follow-up CRP level were 16.58, 5.48, and 5.50 respectively, in the ECBT group and 16.04, 5.52, and 5.66 in the MBCT group, respectively. However, there was no significant difference between the pretest, posttest, follow-up CRP levels (16.38, 17.36, and 16.66, respectively)

Table 3: Demographic information of participants in three experimental groups

		Gender (frequency distribution		Marital status (frequency distribution)		Educational attainment (frequency distribution)					
Group	Age (Mean ± SD)	Male	Female	Single	Married	High school diploma	Associate's degree	Bachelor's degree	Master's degree or higher	Age of onset (Mean ± SD)	Duration of affliction (Mean ± SD)
ECBT	36.60 (5.91%)	5 (50%)	5 (50%)	3 (30%)	7 (70%)	2 (20%)	1 (10%)	5 (50%)	2 (20%)	17.10 (6.51%)	19.50 (5.36%)
MBCT	34.60 (7.25%)	5 (50)	5 (50)	3 (30%)	7 (70%)	2 (20%)	-	8 (80%)	-	21.00 (10.81%)	13.60 (9.24%)
Control	32.10 (5.22%)	5 (50)	5 (50)	5 (50%)	5 (50%)	2 (20%)	1 (10%)	5 (50%)	2 (20%)	16.80 (5.71%)	15.30 (7.73%)

Table 4: The mean pretest, posttest, and follow-up CRP levels in ECBT, MBCT, and control groups

		Pretest		Posttest		Follow-up	
Variable	Group	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
CRP level	ECBT	16.58	1.32	5.48	1.57	5.50	1.24
	MBCT	16.04	1.61	5.52	1.71	5.66	1.38
	Control	16.38	1.11	17.36	1.21	16.66	1.31

in the control group (Table 4).

According to the results of Table 5, the results of Lambda Wilks test showed that the effect of time and group interaction on CRP was significant ($p < 0.001$, $F = 36.17$). The variance of group scores is related to group membership. According to the results of the above test, repeated measures analysis of variance can be used to evaluate the effectiveness of ECBT and MBCT on CRP.

Table 6 presents the results of the ECBT and MBCT on CRP. Based on these results, the inter-group effects of measurement time ($p = 0.001$, $F = 533.17$) and time and group interaction ($p = 0.001$, $F = 132.28$), as well as the intra-group effects ($P < 0.01$, $F = 129.32$) showed a significant difference CRP scores at least between one or both groups of ECBT and MBCT. There is evidence that the Eta values indicate acceptable inter-group effect size of measurement time ($\eta 2 > 0.95$) and time-group interaction ($\eta 2 = 0.91$), and intra-group Eta values was acceptable too ($\eta 2 = 0.91$). This shows that there is a significant difference between ECBT and MBCT groups and control group.

The results of comparing the effects of ECBT and MBCT on the CRP level are shown in Table 7. The results indicated that there was a significant difference between the ECBT and the control groups ($mean_{diff}=7.20$, $p<0.001$) and also between the MBCT and the control groups ($mean_{diff} = 6.88$, $p<0.001$) in terms of the mean CRP level. These figures indicate the significant reduction of the posttest CRP level in ECBT and MBCT groups compared to the control group. The same results were also obtained during the follow-up period. The

Table 5: Results of repeated measures analysis of variance for intergroup effects of time and group interaction on CRP

Variable	Source	Test	Value	F	the first rate of freedom	Error rate of Freedom	Significance	Eta
CRP	Time of measurement	Wilks Lambda	050/	275.29	2	26	000.0 *	960/
	Interference of Time and Group	Wilks Lambda	070/	36.17	4	52	000.0 *	740/

* $p< 0.001$

Table 6: Intra-group and inter-group effects test results using repeated measures analysis of variance on CRP levels

Effects	Variable	Variation Sources	Sum of Squares	Degree of Freedom	Mean of Squares	F	Significance	Eta
Inter-group	CRP	Time of Measurement	21.1133	2	60.566	17.533	*000.0	95.0
		Time× Group	30.562	4	58.140	28.132	*000.0	91.0
		Error	39.57	54	06.1			
Intra-Group	CRP	Constant Value	74.12191	1	74.12191	59.3174	*000.0	99.0
		Group	27.993	2	64.496	32.129	*000.0	91.0
		Error	69.103	27	84.3			

* $p < 0.001$.

Table 7: The results of the Bonferroni post-hoc test for pairwise comparison of the mean CRP level

Variable	Group	Compared group	Mean difference	Standard error	Significance level
CRP level	ECBT	MBCT	-0.32	0.51	1.00
		Control	-7.20	0.51	0.000*
	MBCT	ECBT	0.32	0.51	1.00
		Control	-6.88	0.51	0.000*
	Control	ECBT	7.20	0.51	0.000*
		MBCT	6.88	0.51	0.000*

results demonstrated that there was no significant difference between the effects of ECBT and MBCT on the CRP level ($mean_{diff}$=0.32, p<0.001).

Discussion and Conclusion

The present study aimed to compare the effects of ECBT and MBCT on the CRP level of patients with psoriasis. The results showed a significant reduction in the posttest CRP level in both ECBT and MBCT groups compared to the control group. The same results were also obtained during the follow-up period. The results also demonstrated that there was no significant difference between ECBT and MBCT in terms of their effects on the CRP level of patients with psoriasis (p>0.05). Eisendrath et al. (2016) showed that MBCT reduced the CRP level in patients with Major Depressive Disorder (MDD). Chen et al. (2012) also reported that Cognitive-Behavioral Therapy (CBT) reduced the CRP level in patients with sleep disorders. These results are consistent with the findings of the present study, one of the underpinning principles of mindfulness-based therapies (Berking, 2008) which focuses on problem acceptance rather than controlling or fighting the problem (Burch, 2017).

Consistent with the result of this study, Nazemi et al. (2019) showed that the effect of intervention of Cognitive–Behavioral Stress Management on psychological indices (stress, depression, and anxiety), immunity (ESR and CRP), and pain severity of the patients with Rheumatoid arthritis was significant. They showed that by executing this mental–social intervention, experience of chronic Rheumatoid arthritis was used as an opportunity for training strategies based on stress management.

By contrast, Carrie et al. (2014) showed that CBT did not significantly change the CRP level in patients with MDD. Memon et al. (2017) also reported that neither MBCT nor ECBT could affect the CRP level in patients with depression and anxiety.

The CRP level was very high in psoriasis patients, and the higher the CRP level is, the more severe the skin lesions would be in these patients. In addition, the high CRP level is associated with systemic inflammation in these patients (Ansar et al., 2012). Studies have shown that the CRP level in psoriasis patients is higher than healthy individuals, and the high CRP level in these patients exacerbates the symptoms of psoriasis (Farshchian et al., 2016; Sudhesan et al., 2016; Vadakayil et al., 2015; Alibeigi et al., 2014; Coimbra et al., 2010).

CRP levels were also measured in patients with psychological disorders. In a study performed on 80 patients, elevated levels of CRP were associated with depression and anxiety (Genevqa et al., 2011). A study performed on 73,131 participants showed that elevated CRP levels are associated with a high risk of psychological distress and depression (Wium et al., 2013). Other researchers also found similar results (Cepeda et al., 2007-2012).

Similar to the hypnosis trance state, some of the mindfulness practices encourage a state of physical arousal reduction (relaxation) (Tausk & Withmore, 1999). These states of relaxation can reduce psychological and physiological arousal. If mindfulness skills reduce the frequency with which an individual enters a state of physiological

arousal, this may be a mechanism for improving physical health status (Hamilton-West, 2011).

Emotional reactivity to a stimulus activates the SNS, producing a physiological arousal response. SNS activation is characterized by increase in heart rate and perspiration and can be monitored by measures of skin conductance (SCL), heart rate (HR) and peripheral temperature (PT). Mindfulness has been reported to reduce emotional reactivity (Erisman & Roemer, 2010) and SCL (physical arousal response) (Lush et al., 2009) in response to acute stress.

In Emotion-Focused therapies, the therapist not only focuses on activating the mental content denied or distorted by the client, but also attempts to provide the client with new meanings influenced by the client's physical experience (Greenberg & Watson, 2006). Psychological therapies, such as ECBT, can be effective in the treatment of problems and conditions caused by psoriasis.

Cognitive-behavioral therapy for emotion-driven behavior may reduce the effects of CRP in patients with psoriasis by reducing its negative effects. Numerous studies have shown an association between emotions or physical and psychological stressors with CRP levels (Apelton et al., 2011).

Early evidence suggests that mindfulness-based therapies are associated with decreased sympathetic activity and increased parasympathetic activity (Audette et al., 2006; Creswell & Lindsey, 2014; Motivala et al., 2006). Sympathetic balance is thought to reduce inflammation by reducing the adrenergic signal. Increased parasympathetic nervous system activity may also reduce inflammation through the anti-inflammatory cholinergic pathway (Tracey, 2009).

At the psychological level, mindfulness-based cognitive therapy targets psychological processes that are directly and indirectly related to the threat, reward, and regulatory areas of the brain and physiological systems associated with stress. Mindfulness-based cognitive therapy reduces stress, depression, and perceived anxiety, along with increasing control, self-efficacy, emotion regulation, and life with calm and meaningfulness (Gard et al., 2014; Goyal et al., 2014; Holzel et al., 2011).

Some mindfulness-based therapies may also have an effect on a process that is not directly affected by the intervention, but are still important for inflammation. For example, Cresswell et al. (2012) found that reducing stress based on mindfulness leads to a decrease in loneliness, which is associated with a decrease in inflammatory activity. In addition, mindfulness-based therapies may influence inflammatory-related health behaviors, such as sleep (Irwin et al., 2014).

Comparing the averages of the two experimental groups shows that there is no significant difference between their effectiveness, in the both post-test and follow-up phases. Therefore, according to the obtained results, the use of ECBT and MBCT can be considered effective, but in terms of preference, the superiority of one treatment over another was not seen in this study. This result can mean a positive effect and almost similar to both types of intervention.

Future studies are recommended to investigate the effects of ECBT and MBCT on the other major biomarkers of psoriasis.

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Conflict of interests

There was no conflict of interest in this study.

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