



## The role of fatigue and depression in illness perception of patients with Multiple Sclerosis

Mohammad Hossein Abdollahi<sup>1</sup>, Mahnaz Shahgholian<sup>2</sup>, Shahab Baheshmat<sup>3</sup>

1 Associate Professor, Department of Psychology, School of Psychology and Educational Sciences, Kharazmi University, Tehran, Iran

2 Assistant Professor, Department of Psychology, School of Psychology and Educational Sciences, Kharazmi University, Tehran, Iran

3 Iranian National Center for Addiction Studies, Iranian Institute for Reduction of High-risk Behaviors, Tehran University of Medical Sciences, Tehran, Iran

### Original Article

#### Abstract

**BACKGROUND:** Fatigue and depression affect the illness perception of patients with multiple sclerosis (MS). The purpose of the present study was to investigate the role of fatigue and depression in illness perception of patients with MS.

**METHODS:** The present study was a descriptive correlational research. The target population was all patients with MS who referred to the Iranian MS Society. The sample consisted of 138 patients who were selected using convenience sampling. Data were gathered using the Fatigue Severity Scale (FSS), Beck Depression Inventory (BDI), and Brief Illness Perception Questionnaire (Brief IPQ) and were analyzed via stepwise regression analysis and Pearson's correlation coefficient.

**RESULTS:** Based on study findings, fatigue and depression had a statistically significant relationship with all subscales of illness perception. The results of stepwise regression analysis indicated that fatigue and depression predict disease outcome, personal control, therapeutic control, identity, concern, illness recognition, and emotion regulation among patients with MS.

**CONCLUSION:** The findings of this research showed that illness perception, as an effective indicator in patient's quality of life (QOL), appears to be predicted by fatigue and depression.

**KEYWORDS:** Fatigue, Depression, Perception, Multiple Sclerosis

*Date of submission:* 22 Nov. 2015, *Date of acceptance:* 03 Jan. 2016

**Citation:** Abdollahi MH, Shahgholian M, Baheshmat S. **The role of fatigue and depression in illness perception of patients with Multiple Sclerosis.** *Chron Dis J* 2016; 4(2): 39-47.

### Introduction

Multiple sclerosis (MS) is a chronic,<sup>1</sup> demyelinating,<sup>2</sup> autoimmune,<sup>3</sup> and progressive disease in the central nervous system (CNS).<sup>4</sup> The disease affects the brain and spinal cord, and affects with a range of potential disabling symptoms, including changes in feelings, vision problems, muscle weakness, depression, and problem in coordination and speaking,

severe fatigue, cognitive impairment, balance problems, and pain.<sup>5,6</sup> MS often affects the young population of societies and causes disability among these patients;<sup>1</sup> thus, it has received a great deal of scientific attention. The goal of most scientific and practical developments in this area is to provide conditions that do not decrease the quality of life (QOL) of patients to the extent possible and cause the least harm to the patient's family and society.<sup>7</sup>

Therefore, the determination of factors related to QOL in patients with MS seems to be

#### Corresponding Author:

Shahab Baheshmat

Email: [shahab.baheshmat@gmail.com](mailto:shahab.baheshmat@gmail.com)

necessary. Various studies of variables such as personality traits,<sup>8</sup> disability,<sup>9</sup> cognitive impairment,<sup>10</sup> and perception of the disease had great impact on the QOL of these patients.<sup>11</sup> Considering the existing gap in the research and the significance of the perception of disease, the present study addressed the factors associated with the perception of disease in patients with MS. The importance of this topic is due to the fact that the perception of disease as a threatening factor can lead to adverse outcomes and reduce the QOL of these patients.<sup>12</sup> In fact, this structure affects social psychological and family structures, and the implications of research on QOL-related issues, which are closely related to anxiety, depression, and physical functioning, and psychology of the relationship.<sup>11</sup> In patients with MS, the lack of effective control, complications, and clear efficacy results can affect their perceptions of their disease.<sup>13</sup>

Considering that the perception of the illness in the members of the community is affected by the problems affecting the whole community, tools with high consistency should be used and the effectiveness of their implementation, that can be customized and improved, should be assessed. The examination of this structure is an important requirement in patients with MS.<sup>14</sup> The most widely applied model for explaining the relationship between illness perceptions and emotional and behavioral responses is the self-regulatory model.<sup>15</sup>

The theoretical basis of the present study was the Leventhal self-regulation theory, which focuses specifically on the role of disease perception and experiences of symptoms, and is based on the nature of the patient, duration of illness, and therapeutic control. Based on this model, the evaluation of illness is based on the assessment of the impact and effective deployment of a comprehensive set of related behaviors, followed by monitoring activities.<sup>13</sup> Moreover,

this model emphasizes that some stimuli, including physical symptoms and existing health beliefs, provide emotional and cognitive representations of disease.<sup>16</sup>

In general, the Leventhal self-regulation model as an appropriate model examines the role of disease perception and emotional responses in chronic diseases.<sup>17</sup> In this regard, research evidence suggests that the subscales of this structure, i.e., the nature and timing of responses, are the major predictors of positive recognition in the residents. In contrast, cognitive knowledge and personal control are very important in psychological disorders.<sup>18</sup> Some research findings suggest that the workforce needs to be integrated into the implementation of a global approach and work to reduce anxiety.<sup>19</sup> In fact, the perception of disease is correlated with anxiety.<sup>20</sup>

On the other hand, the perception of disease adversely reduces the therapeutic follow-up in individuals with chronic illness and increases depression in these patients.<sup>14</sup> The literature shows that mood disorders are common in patients with MS and depression is the most common of these disorders. In explaining this relationship, it can be stated that the development of chronic diseases, such as MS, affects the ability to move and work and health of patients due to various symptoms,<sup>1</sup> and increases the risk of the development of psychiatric disorders, such as depression.<sup>21</sup> The incidence of major depression in these patients has been estimated at 50% in several studies, which is significantly higher than the general population and other neurological disorders. In addition, suicidal tendencies in these patients are largely linked to the presence of major depression.<sup>22</sup>

Costa *et al.* showed that symptoms of depression are related to the perception of disease. In this study, the subscales of outcome, nature of illness, disease recognition, and anxiety were found to have significant relationships with depression in patients with

chronic pain.<sup>23</sup> Shallcross *et al.*, in a study on patients suffering from epilepsy, showed that the high prevalence of depression is associated with a negative perception and low QOL.<sup>24</sup> Steca *et al.*, in their study on cardiovascular disease (CVD), showed that perception of disease was associated with depression in these patients.<sup>25</sup> In their study, Price *et al.* showed that subscales of perceived disease such as outcome, nature of illness, concern, personal control, and emotional response were associated with depression in chronic diseases.<sup>16</sup> Philip *et al.* in a study on patients suffering from lupus, found a significant relationship between depression and the subscales of outcome, disease control, and disease duration.<sup>17</sup>

Additionally, perceptions of illness are tied to tangible fatigue, as those who are more likely to experience fatigue, are expected to experience longer disease duration, and negative beliefs have many harmful outcomes. Moreover, high prevalence of fatigue is associated with a disability in personal control and a lack of confidence in the therapeutic outcome.<sup>26</sup> Grayson *et al.*, in a research study, showed that the perception of disease has a causal role in the survival of patients with vasculitis.<sup>27</sup> In fact, the most frustrating,<sup>28</sup> and the most debilitating symptom of MS is fatigue, which affects about 75-90% of patients.<sup>29</sup> Fatigue is often defined as a lack of energy, a feeling of exhaustion and general weakness. In this regard, the International Society for Multiple Sclerosis has defined fatigue as a mental or physical lack of energy perceived by a person or caretaker that interferes with the person's usual activities. Fatigue significantly affects QOL and has major socioeconomic outcomes such as frequent absence from work and subsequent loss of employment. It also interferes with the daily lives of patients with MS, including their private life. Despite the many studies and extensive researches, the nature and cause of

fatigue in these patients have not been understood.<sup>30</sup> However, some sources suggest that this syndrome is caused by demyelination.<sup>31</sup>

Verified treatments for MS have limited effects on fatigue. The reason for this problem has not been clearly defined, although various pathophysiological mechanisms have been considered.<sup>30</sup> Therefore, fatigue is one of the main causes of disability in patients MS, and there is currently no specific treatment for this symptom of MS. Depression symptoms such as loss of motivation or lack of pleasure can be confused with fatigue. Fatigue may be one of the symptoms of depression. However, some of the causes of fatigue in patients with MS may be treatable (for example, depression) and finding and recognizing them among these people is a challenge since the relationship between fatigue and mood disorder in patients with MS is unclear.<sup>32</sup> Therefore, fatigue and depression in the majority of patients with MS are known to be the most debilitating symptoms. Several studies have shown that these symptoms can affect chronic illnesses in patients.<sup>16</sup> As mentioned above, the present study was designed to predict the perception of patients with MS suffering from fatigue and depression.

## Materials and Methods

This research was a descriptive and correlational study that examined the correlation between predictor variables and the criterion variable, and the predictive power of this correlation. The purpose of this study was to investigate the variables of perceived disease of patients with MS as criterion variables based on the predictors of depression and fatigue. The statistical population of this study consisted of all patients suffering from MS in Iran in 2017, whose were diagnosed by a neurologist and had a medical file in this regard in Iranian MS Society. Convenience sampling method was used; therefore,

138 individuals participated in the study. The inclusion criteria were good reading and writing skills and sufficient physical and mental fitness to complete the research tools, and the exclusion criteria were disease duration of less than 1 year, severe cognitive impairment, or other chronic diseases.

In order to observe ethical considerations, the participants were entered into the research after obtaining informed consent from the patients or their relatives and assuring them that their personal information would remain confidential. Finally, the patients completed the research tools under the supervision of one of the authors of the study who was present at the site of the study.

Data were analyzed using descriptive statistics (mean and standard deviation), and non-inferential statistics (Pearson correlation coefficient and stepwise regression) in SPSS software (version 21, IBM Corporation, Armonk, NY, USA).

#### **Measurement tools**

**Fatigue Severity Scale:** A fatigue measurement tool was developed in 1988 by a neurologist named Krupp to measure fatigue in patients suffering from MS. This tool is one of the most reliable scales for measuring the severity of fatigue in patients with MS. This scale consists of 9 questions, that 5 question assess the quality of fatigue, 3 questions quantify physical and mental fatigue that determine the social status of a person, and 1 question quantifies the severity of fatigue with other MS symptoms. The score of each question ranges from 1 to 7; a score of 1 means that the person strongly opposes the situation and the score of 7 means the person fully agrees. A score of 7 shows the highest level of fatigue and a score of 1 indicates a lack of fatigue. Shahvarughi Farahani et al. studied the validity and reliability of the Persian version of the Fatigue Severity Scale (FSS) among patients with MS in Iran.<sup>33</sup> The internal consistency of the questionnaire items was calculated using Cronbach's alpha

coefficient and was equal to 0.96, which indicates internal consistency of all items.

**Beck Depression Inventory:** The Beck Depression Inventory (BDI), compiled in 1961, is one of the most widely used instruments for measuring mental disorders. This questionnaire contains 21 questions regarding depression symptoms, each of which consists of 4 or 5 sections. The items are scored on scale ranging from 0 to 3 (0 is the absence of symptoms of depression and 3 indicates the high severity of the disorder in that aspect). In this scale, 2 parts are subjective and 11 are cognitive, 2 are attributed to noticeable behaviors, 5 to physical symptoms, and 1 to internal symptoms, all of which are related to the symptoms of major depression. A large number of studies have been conducted to verify the validity and reliability of the BDI, all of which have approved the reliability of this test and reported the internal consistency of this scale between 0.73 and 0.92. The reliability of this questionnaire was reported between 0.48 and 0.86 according to the type of statistical population.<sup>34</sup>

**Brief Illness Perception Questionnaire:** The Brief Illness Perception Questionnaire (Brief IPQ) consists of 9 questions designed to evaluate the emotional and cognitive visualization of the disease. The questions determine the consequences, duration, personal control, therapeutic control, nature of illness, concern, and disease recognition along with emotional response, and cause of the disease. The range of total scores of the first 8 questions consists of 1 to 10. Question 9 is an open-ended question regarding the 3 major causes of the disease. In the final analysis, it is recommended that each of the subscales be analyzed separately. The Brief IPQ consists of 5 subscales of cognitive responses to the disease, including perceived consequences (Article 1), duration of illness (Article 2), personal control (Article 3), control through treatment (Article 4), and recognition of



symptoms (Article 5). It also has the 2 subscales of concern about illness (Article 6) and emotions (Article 8) which measure emotional responses, and 1 subscale measuring the ability to understand and perceive the disease (Article 7). The final item is an open-ended question (Article 9), which asks the patient to list the most important factors that caused their illness. The reliability of each subscale of this questionnaire ranged from 0.48 to 0.70. The validity of the personal control subscale was approved among patients with diabetes. Bagherian *et al.* provided the Persian version of this questionnaire.<sup>35</sup> The Cronbach's alpha of the Persian version of this scale was 0.84 and its correlation coefficient was 0.71. In general, the results derived from the evaluation of the Persian version of this scale showed a good and satisfactory validity among other patients.

## Results

Of the 138 patients with MS participating in this study, 94 (68%) were women and 44 (32%) men and in the age range of 24-58 years (mean: 60.35 years). The majority of participants (82 patients, 59.4%) were married. In terms of education, the majority of people (71 individuals, 51.4%) had a diploma; among the remaining 51 individuals (37%) 12% had a B.A., 7.8% were under diploma, and 4 individuals (2.9%) had an M.A.

The disease history was also studied, which showed that 77.5% of the people had a history of hospitalization and 81.2% had used medication. The incidence of the disease varied between the ages of 1 to 15 (mean: 26.5 years), and in most of the patients, 1 to 5 had passed years after diagnosis. Furthermore, 34% of the patients were employed and 66% were unemployed; however, most patients were active between 1 and 4 hours per day.

The Pearson correlation coefficient and stepwise regression analysis were used to determine the role of fatigue and depression in

explaining and predicting the perceptual representation of patients with MS. The tests have assumptions that were considered before the inferential analysis. One of the foregoing is the normal distribution of research variables; the Shapiro-Wilk test was used to measure the fitting of predictive and criterion variables. The results of the Shapiro-Wilk test showed that the scores of fatigue variables ( $P < 0.001$ ;  $\alpha = 0.050$ ), depression ( $P = 0.227$ ;  $\alpha = 0.050$ ), and perception of disease ( $P < 0.001$ ;  $\alpha = 0.050$ ) do not differ significantly from the normal curve, which indicates the normal distribution of the research variables.

The second is the linearity of the relationship between the criterion variable and a predictive variable when all other predictor variables are kept constant. The results of the data analysis show that, except for the disease duration variable, the relationship between predictor variables and other criterion variables follows this assumption ( $P < 0.050$ ).

Another predictor of regression analysis is the lack of correlation between predictive variables (linear multiplicity), which was used to evaluate the validity or tolerance of the variables and the variance inflation factor (VIF). The results showed that the degree of tolerance was close to 1 and the VIF was less than 2. Therefore, by fulfilling the assumptions of the Pearson correlation coefficient and stepwise regression analysis, it is possible to use these tests to investigate the research hypotheses.

Table 1 shows the central indices and the variability of the research variables. The skewness and elongation of all variables were between 1+ and 1, which indicates the normal distribution of the variables of the research.

The correlation matrix of the research variables along with their correlation coefficients and their significance levels are provided in table 2. As shown in this table, the predictor variables of depression and fatigue had a significant relationship with the outcome

**Table 1. Descriptive statistics related to research variables**

Variable	Minimum	Maximum	Mean	SD	Kurtosis	Skewness
Disease outcome	1	8	4.20	1.66	-0.36	0.11
Disease duration	1	9	4.70	1.75	-0.13	0.14
Self-control	1	8	4.59	1.86	-0.58	0.14
Therapeutic control	1	8	4.55	1.90	-0.61	-0.03
Nature of disease	1	8	4.62	1.95	-0.76	0.40
Concern	1	9	4.96	1.86	-0.53	0.60
Recognizing the disease	1	9	4.64	2.03	-0.71	0.16
Emotional response	1	9	4.54	1.91	-0.65	0.25
Depression	15	49	31.53	6.68	-0.30	-0.18
Fatigue	14	58	37.99	9.24	-0.37	-0.12

variables of personal control, therapeutic control, and nature of illness, concern, disease recognition, and emotional response. This relationship was negative in the variables of personal control, therapeutic control, and disease recognition.

The correlation matrix also shows that there is no significant relationship between predictive variables and disease duration; a summary of the step-by-step regression model is presented in table 3. The results of stepwise regression analysis in predicting the outcomes of the disease showed that in the first step, fatigue explained the significant (0.04%) variance of the outcomes of the disease. Moreover, the results of stepwise regression analysis showed that in the second step, depression and fatigue totally explained 20%, 11%, and 12% of the variance of the variables of self-control, therapeutic control, and recognizing the disease, respectively. In

addition, 0.051%, 0.056%, and 0.096% of the variance of the variables of personal control, nature of illness, concern, and emotional responses in the first step were explained only by fatigue, respectively.

### Discussion

Considering the fact that the perception of disease has a significant role in the QOL of individuals with MS and based on the available theoretical and empirical literature on the role of fatigue and depression as important correlates of perception of disease, these subjects were emphasized in the present study. The purpose of this study was to investigate the role of fatigue and depression in MS. Our results showed that there was a positive correlation between depression and some of the subscales of perceived disease such as disease outcomes, nature of illness, concern, and emotional response.

**Table 2. Correlation matrix of research variables**

Variables	1	2	3	4	5	6	7	8	9	10
1.Disease outcome	1									
2.Disease duration	0.19*	1								
3.Self-control	0.15	0.05	1							
4.Therapeutic control	0.15	0.02	0.42**	1						
5.Nature of disease	0.33**	0.21*	0.22*	0.17*	1					
6.Concern	0.35**	0.23**	0.14	0.13	0.37**	1				
7.Recognizing the disease	0.19*	0.07	0.37**	0.32**	0.14	0.17	1			
8.Emotional response	0.43**	0.37**	0.30**	0.12	0.43**	0.45**	0.19	1		
9.Depression	0.19*	0.07	-0.29**	-0.23**	0.21*	0.22*	-0.27**	0.23**	1	
10.Fatigue	0.20*	0.04	-0.24**	-0.20*	0.22**	0.23**	-0.23**	0.26**	0.13*	1

\* P &lt; 0/050; \*\* P &lt; 0/010

**Table 3. Stepwise regression model and subscales of perception of disease in terms of fatigue and depression**

Criterion Variable	Step	Predictor Variable	F	P	R	R <sup>2</sup>	β	t	P
Disease outcome	1	Fatigue	6.05	0.015	0.206	0.043	0.206	2.46	0.015
Self-control	2	Depression	16.84	< 0.001	0.447	0.200	2.740	4.84	< 0.001
		Fatigue					2.470	4.36	< 0.001
Therapeutic control	2	Depression	8.67	< 0.001	0.338	0.114	1.990	3.33	0.001
		Fatigue					1.770	2.96	0.004
Nature of disease	1	Fatigue	7.36	0.007	0.227	0.051	0.227	2.71	0.007
Concern	1	Fatigue	8.00	0.005	0.236	0.056	0.236	2.82	0.005
Recognizing the disease	2	Depression	9.59	< 0.001	0.353	0.124	1.920	3.24	< 0.001
		Fatigue					1.670	2.81	0.006
Emotional response	2	Depression	7.20	0.001	0.310	0.096	1.470	2.44	0.016
		Fatigue					1.220	2.03	0.044

Depression was also correlated with some other subscales of illness such as personal control, therapeutic control, and recognition of the disease. However, there was no significant relationship between depression and disease duration. In the next step, regression analysis was applied step-by-step to determine the contribution of each variable of fatigue and depression in the explanation of the subscale of perception of disease. The results of regression analysis showed that depression significantly predicted the changes in personal control, therapeutic control, and recognition of the disease in changes in emotional responses. In explaining these results, it can be said that decrease in depression and fatigue increased personal control, and cognitive and therapeutic control. Therefore, lower degrees of depression and fatigue in individuals with MS result in stronger beliefs in patients about their own knowledge and control of the disease, and more promising treatment outcomes. On the other hand, increase in the degree of depression and fatigue will strengthen patients' belief that disease affects their overall QOL (the outcome of the disease), resulting in greater concern and negative emotional responses.

These findings are in line with the researches by Costa *et al.*,<sup>23</sup> Steca *et al.*,<sup>25</sup> Price *et al.*,<sup>16</sup> and Philip *et al.*<sup>17</sup> In the literature, quantitative studies have systematically

examined the role of fatigue in perception of the disease in people with MS. In accordance with the findings of Grayson *et al.*,<sup>27</sup> in a study on patients suffering from vasculitis, and the research by Alsen and Eriksson,<sup>26</sup> on patients who had suffered an infarction, the results of this study showed a positive correlation between fatigue and the outcomes of the disease, nature of illness, concern, and emotional response.

In addition, fatigue had a significant negative relationship with personal control, therapeutic control, and recognition of the disease. The results of regression analysis showed that fatigue alone predicts the variance in disease outcome, nature of illness, and concern. In explanation, it can be stated that with increasing fatigue in patients with MS, their QOL is affected and their experience of symptoms increases their concern. Considering the findings of this study, it can be concluded that fatigue and depression are two important factors in the perception of disease in people with MS. Moreover, in the manifestation of most of the behaviors associated with the disease in these patients, these two constructs are affected.

### Conclusion

The results of this research can be considered at two theoretical and practical levels. At the

theoretical level, the findings of the present study confirmed the Leventhal self-regulatory model for the perception of disease. At the applied level, the results of this study can be a suitable empirical basis for developing comprehensive educational, interventional, and therapeutic programs for these patients, which should be emphasized psychological factors along with physical factors. Pencil-paper assessment of disease perception, fatigue, and depression, and small sample volume, and convenience sampling method are among the important limitations of this research which have reduced the generalizability of the results. Moreover, correlational research method was used that does not have credibility and certainty as far as experimental research is concerned. Therefore, studying the variables of the research through self-report and other methods of measuring, and performing longitudinal and cross-sectional studies with other variables related to perception of disease can lead to achievable findings.

### Conflict of Interests

Authors have no conflict of interests.

### Acknowledgments

We sincerely thank all the patients who participated in this research, as well as the Iranian Multiple Sclerosis Society.

### References

1. Friczka-Nagy Z, Fuvesi J, Rozsa C, Komoly S, Jakab G, Csepany T, et al. The effects of fatigue, depression and the level of disability on the health-related quality of life of glatiramer acetate-treated relapsing-remitting patients with multiple sclerosis in Hungary. *Mult Scler Relat Disord* 2016; 7: 26-32.
2. Fischer A, Schroder J, Vettorazzi E, Wolf OT, Pottgen J, Lau S, et al. An online programme to reduce depression in patients with multiple sclerosis: A randomised controlled trial. *Lancet Psychiatry* 2015; 2(3): 217-23.
3. Ifantopoulou N, Artemiadis K, Triantafyllou N, Chrousos G, Papanastasiou I, Darviri C. Self-esteem is associated with perceived stress in multiple sclerosis patients. *Neurol Res* 2015; 37(7): 588-92.
4. Maurer M, Comi G, Freedman MS, Kappos L, Olsson TP, Wolinsky JS, et al. Multiple sclerosis relapses are associated with increased fatigue and reduced health-related quality of life-A post hoc analysis of the TEMSO and TOWER studies. *Mult Scler Relat Disord* 2016; 7: 33-40.
5. Moscarello MA, Lei H, Mastronardi FG, Winer S, Tsui H, Li Z, et al. Inhibition of peptidyl-arginine deiminases reverses protein-hypercitrullination and disease in mouse models of multiple sclerosis. *Dis Model Mech* 2013; 6(2): 467-78.
6. Opara JA, Broła W, Leonardi M, Blaszczyk B. Quality of life in Parkinson's disease. *J Med Life* 2012; 5(4): 375-81.
7. Mokhtary S. The effect of group cognitive-behavioral therapy on depression of multiple sclerosis patients [MSc Thesis]. Isfahan, Iran: University of Isfahan; 2005. [In Persian].
8. Zarbo IR, Minacapelli E, Falautano M, Demontis S, Carpentras G, Pugliatti M. Personality traits predict perceived health-related quality of life in persons with multiple sclerosis. *Mult Scler* 2016; 22(4): 551-8.
9. Hadgkiss EJ, Jelinek GA, Weiland TJ, Pereira NG, Marck CH, van der Meer DM. The association of diet with quality of life, disability, and relapse rate in an international sample of people with multiple sclerosis. *Nutr Neurosci* 2015; 18(3): 125-36.
10. Labiano-Fontcuberta A, Mitchell AJ, Moreno-Garcia S, Benito-Leon J. Cognitive impairment in patients with multiple sclerosis predicts worse caregiver's health-related quality of life. *Mult Scler* 2014; 20(13): 1769-79.
11. Bassi M, Falautano M, Cilia S, Goretti B, Grobberio M, Pattini M, et al. Illness perception and well-being among persons with multiple sclerosis and their caregivers. *J Clin Psychol Med Settings* 2016; 23(1): 33-52.
12. Stafford L, Berk M, Jackson HJ. Are illness perceptions about coronary artery disease predictive of depression and quality of life outcomes? *J Psychosom Res* 2009; 66(3): 211-20.
13. Wilski M, Tasiemski T. Illness perception, treatment beliefs, self-esteem, and self-efficacy as correlates of self-management in multiple sclerosis. *Acta Neurol Scand* 2016; 133(5): 338-45.
14. Petrie KJ, Weinman J. Why illness perceptions matter. *Clin Med (Lond)* 2006; 6(6): 536-9.
15. Foxwell R, Morley C, Frizelle D. Illness perceptions, mood and quality of life: A systematic review of coronary heart disease patients. *J Psychosom Res* 2013; 75(3): 211-22.
16. Price A, Goodwin L, Rayner L, Shaw E, Hansford P, Sykes N, et al. Illness perceptions, adjustment to



- illness, and depression in a palliative care population. *J Pain Symptom Manage* 2012; 43(5): 819-32.
17. Philip EJ, Lindner H, Lederman L. Relationship of illness perceptions with depression among individuals diagnosed with lupus. *Depress Anxiety* 2009; 26(6): 575-82.
  18. Sawicki GS, Sellers DE, Robinson WM. Associations between illness perceptions and health-related quality of life in adults with cystic fibrosis. *J Psychosom Res* 2011; 70(2): 161-7.
  19. Broadbent E, Ellis CJ, Thomas J, Gamble G, Petrie KJ. Further development of an illness perception intervention for myocardial infarction patients: A randomized controlled trial. *J Psychosom Res* 2009; 67(1): 17-23.
  20. Zyrianova Y, Kelly BD, Sheehan J, McCarthy C, Dinan TG. The psychological impact of arthritis: The effects of illness perception and coping. *Ir J Med Sci* 2011; 180(1): 203-10.
  21. Hoang H, Laursen B, Stenager EN, Stenager E. Psychiatric co-morbidity in multiple sclerosis: The risk of depression and anxiety before and after MS diagnosis. *Mult Scler* 2016; 22(3): 347-53.
  22. Mrabet S, Ben AN, Kchaou M, Belal S. Depression in multiple sclerosis. *Rev Neurol (Paris)* 2014; 170(11): 700-2.
  23. Costa EC, Vale S, Sobral M, Graca PM. Illness perceptions are the main predictors of depression and anxiety symptoms in patients with chronic pain. *Psychol Health Med* 2015; 1-13.
  24. Shallcross AJ, Becker DA, Singh A, Friedman D, Montesdeoca J, French J, et al. Illness perceptions mediate the relationship between depression and quality of life in patients with epilepsy. *Epilepsia* 2015; 56(11): e186-e190.
  25. Steca P, Greco A, Monzani D, Politi A, Gestra R, Ferrari G, et al. How does illness severity influence depression, health satisfaction and life satisfaction in patients with cardiovascular disease? The mediating role of illness perception and self-efficacy beliefs. *Psychol Health* 2013; 28(7): 765-83.
  26. Alsen P, Eriksson M. Illness perceptions of fatigue and the association with sense of coherence and stress in patients one year after myocardial infarction. *J Clin Nurs* 2016; 25(3-4): 526-33.
  27. Grayson PC, Amudala NA, Mclear CA, Leduc RL, Shereff D, Richesson R, et al. Illness perceptions and fatigue in systemic vasculitis. *Arthritis Care Res (Hoboken)* 2013; 65(11): 1835-43.
  28. Russo M, Crupi D, Naro A, Avanzino L, Buccafusca M, Dattola V, et al. Fatigue in patients with multiple sclerosis: From movement preparation to motor execution. *J Neurol Sci* 2015; 351(1-2): 52-7.
  29. Bakalidou D, Giannopoulos S, Voumvourakis K. Annual fatigue and depression fluctuation in multiple sclerosis patients. *Ann Phys Rehabil Med* 2014; 57: e304-e305.
  30. Labuz-Roszak B, Kubicka-Baczyk K, Pierzchala K, Machowska-Majchrzak A, Skrzypek M. Fatigue and its association with sleep disorders, depressive symptoms and anxiety in patients with multiple sclerosis. *Neurol Neurochir Pol* 2012; 46(4): 309-17.
  31. Akaishi T, Nakashima I, Misu T, Fujihara K, Aoki M. Depressive state and chronic fatigue in multiple sclerosis and neuromyelitis optica. *J Neuroimmunol* 2015; 283: 70-3.
  32. Rizou I, De G, V, Papavasiliou A, Maes S. The contribution of illness perceptions to fatigue and sleep problems in youngsters with epilepsy. *Eur J Paediatr Neurol* 2016; 20(1): 93-9.
  33. Shahvarughi Farahani A, Azimian M, Fallahpour M, Karimlou M. Evaluation of reliability and validity of the Persian version of fatigue severity scale (FSS) among persons with multiple sclerosis. *Rehabilitation* 2013; 13(4): 84-91. [In Persian].
  34. Steer RA, Beck AT, Garrison B. Applications of the beck depression inventory. In: Sartorius N, Ban TA, Editors. *Assessment of depression*. Berlin, Germany: Springer-Verlag; 1986. p. 123-42.
  35. Bagherian Sararoudi R, Bahrami Ehsan H, Sanei H. Relationship between history of myocardial infarction and cognitive representation of myocardial infarction. *Research in Psychological Health* 2008; 2(2): 29-39. [In Persian].