Identifying the effective factors on depression in patients with multiple sclerosis using structural equation modeling approach: The role of stress, self-esteem, and mindfulness

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Original Article

Abstract

BACKGROUND: The purpose of this study was to identify the effective factors that are related to depression in people with multiple sclerosis (MS).

METHODS: This study utilized a cross-sectional, descriptive, and correlational design. Statistical population of this research included all patients with MS in Mazandaran Province, Iran, in 2016. The sample consisted of 147 patients who were selected via the available sampling method. For data collection, the Depression, Anxiety, and Stress Scale-21 items (DASS-21), Rosenberg Self-Esteem Scale (RSES), and Freiburg Mindfulness Inventory-Short Form (FMI-SF) were administered for all patients. Then the data was analyzed via SPSS and AMOS software using confirmatory factor analysis (CFA) and structural equation modeling (SEM).

RESULTS: The results of the CFA to review the construct validity of the questionnaires indicated that the model was consistent with the data. SEM indicated that self-esteem served as a mediator between both stress and depression. Also, mindfulness had the role of mediator variable in the relationship between self-esteem and depression.

CONCLUSION: This study adds to the existing literature by providing SEM for depression in patients with MS. Theoretical and practical implications of presented results and model are also discussed.

KEYWORDS: Depression, Life Stress, Self-Concept, Mindfulness, Multiple Sclerosis

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Introduction

Multiple Sclerosis (MS) is a chronic,[1] demyelinating,[2] autoimmune,[3] and progressive disease[4] of the central nervous system (CNS). Chronic diseases such as MS which damage the ability to move, work, and well-being of patients due to various symptoms,[1] increase the risk of developing psychiatric disorders, such as depression.[5] Research evidence suggests that the lifelong prevalence of depression following MS is about 50%, so the prevalence of depression in these patients is more than other chronic or neurological diseases.[6] Therefore, the correlation of depression in these patients seems necessary.

In the same vein, patients with MS face a wide range of psychological challenges such as unpredictable illnesses, side effects of medications, interpersonal relationships management, and job difficulties. The degree of success in coping with these challenges is determined by measuring the psychological

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stress of these individuals.[3] Addressing the issue of stress in these patients is very important because it is significantly related to the adaptability of people with this disorder.[7]

In addition, in some studies, stress is known as a strong predictor of the frequency of relapse of depression[8] and increased stress susceptibility, which reduces the response of individuals to positive stimuli, which are among the main symptoms of depression.[9] Some psychological characteristics affect the level of stress in these patients, and several studies have confirmed the role of self-esteem in stress.

Along with the above line, studies show that people with low self-esteem show limited resources and perceive their environment as uncontrollable, which subsequently increases the risk of depression. In particular, high tension levels can reduce self-esteem.[10]

The interactive model of depression claims that tension-related events reverse self-esteem, which subsequently increases the symptoms of depression. Therefore, the effects of tension-related events on symptoms of depression may be affected by self-esteem. In fact, previous research has shown that self-esteem can play a role in interrelationships between stress events and depression.[11]

Also, self-esteem is directly related to depression, and two vulnerability models[12] and the scar model[13] have explained this relationship. As a result, it can be stated that not only self-esteem is directly related to depression and reduces the symptoms of depression, but also indirectly by reducing stress can reduce the symptoms of depression. In addition to the role of self-esteem in the relationship between stress and depression, mindfulness can also effectively address coping strategies and adaptation strategies by encouraging these patients to communicate with the psychological and physical symptoms, taking into account the multiple and varied consequences of MS.[14]

Change in consciousness is inversely related to changes in the level of stress, in which there is a negative correlation between perceived consciousness and tension and subsequent anxiety.[15] As a result, mind consciousness reduces the amount of stress in patients with MS, and subsequently research literature points out that lower levels of tension are associated with decreasing depression.[16] Also, mindfulness can reduce the symptoms of depression by influencing self-esteem. In this regard, the relationship between mindfulness and self-esteem was studied in some researches.[17] According to what has been said, on the one hand, self-esteem and mindfulness are mutually interrelated and on the other hand, are associated with tension and depression at the same time. Accordingly, the main question of the present research is whether the suggested model for depression in patients with MS is fit with the observed data?

Materials and Methods

The purpose of this study was fundamental, and in terms of collecting and analyzing information, it was a descriptive correlational study based on the structural equation modeling (SEM). The statistical population of this study was all patients with MS in Mazandaran Province, Iran, in 2016, which their disease was diagnosed by a neurologist. Given that the path analysis was performed in SEM based on correlation, a total of 100 to 200 samples were sufficient for this purpose.[18] Accordingly, due to the difficulty of accessing all patients, the sampling method was non-random sampling and therefore, 147 people were selected to participate in the study. Including criteria were having reading and writing skills and adequate physical and mental ability to complete research tools, and excluding criteria included the disease duration of less than one year, presenting in an acute or severe stage of the disease, cognitive impairment, or other chronic physical and psychological illnesses. In order to observe ethical considerations, the participants entered the study with informed consent and were ensured that their personal

information would remain confidential.

Collected data were analyzed by SPSS (version 21, IBM Corporation, Armonk, NY, USA) and AMOS (version 23) statistical software.

Depression, Anxiety, and Stress Scale-21 items (DASS-21): The questionnaire includes 21 questions about depression (7 questions), anxiety (7 questions), and stress (7 questions), which is a shortened version of the DASS-42. The scale was first introduced by Lovibond PF and Lovibond SH in 1995. The items of the questionnaire are designed in a Likert scale with options including not at all, low, medium, and high. The lowest score for each question is zero and the highest score is 3. The validity of this questionnaire in Iran Samani and Joukar determined the validity of the test for subscales of depression, anxiety, and tension to be 0.80, 0.77, and 0.77, respectively, and Cronbach's alpha for each of the subscales has been reported as 0.81, 0.74, and 0.78, respectively.[19] Depending on the purpose of this study, the subscales of depression and stress were used. Finally, the rates of depression and tension were calculated separately for each patient. In the present study, Cronbach's alpha for depression and stress subscales was 0.87 and 0.81, respectively.

Rosenberg Self-Esteem Scale (RSES): The questionnaire was designed by Rosenberg in 1965. This scale consists of 10 self-reports that express the overall sense of value or acceptance, positively. Also, it includes a five-point Likert scale (totally agree to completely disagree), ranging from 1 to 5. In addition, the minimum and maximum scores are from 10 to 50, respectively, with higher scores representing high levels of self-esteem in a person. Rajabi and Karjo Kasmai in 2011 calculated the coefficient of

female consistency in the student sample as 0.84.[20] In this study, Cronbach's alpha coefficient of 0.83 was used to examine the internal consistency of the questionnaire items.

Freiburg Mindfulness Inventory-Short Form (FMI-SF): We used a short form of the FMI. The questionnaire was compiled by Walach et al. and included 14 questions. The subject was asked to answer questions on a 4-point Likert scale (rarely = 1, almost always = 4). It should be noted that phrase 13 is reversed. The minimum score for this questionnaire is 14 and its maximum is 56. A higher score indicates more mindfulness. In Iran, Ghasemi Jobaneh et al. examined its validity and reliability, and Cronbach's alpha was reported to be 0.92 and the reliability test coefficient was 0.83.[21] In this study, Cronbach's alpha coefficient was 0.86 for internal consistency.

Results

The mean age of participants was 35.22 years with a standard deviation (SD) of 6.33. For gender, 43.5% (64 people) were men and 56.5% (83 people) were women. One-way analysis of variance (ANOVA) was used to examine gender differences with each of the variables. The results of the ANOVA showed that gender had no significant effect on any of the variables used in the analysis ($P < 0.050$). Since the SEM for the distribution of abnormal variables can be sensitive, the Kolmogorov-Smirnov test (K-S test) was used to verify the normal distribution of the data, which was confirmed by the normal distribution of variables.

According to table 1, the results of the correlation test among the research variables indicated that there was a significant correlation between all variables at the level of 0.01.

Table 1. Correlation matrix of research variables

Variables	Stress	Self-esteem	Mindfulness	Depression
Stress	1			
Self-esteem	-0.235[*]	1		
Mindfulness	-0.215[*]	0.309[*]	1	
Depression	0.315[*]	-0.448[*]	-0.433[*]	1

[*] $P < 0.010$

Table 2. Fitness of the hypothesized model of research with data based on fitness indices

Fitness indices	χ^2	df	χ^2/df	CFI	IFI	GFI	TLI	RMSEA	P
Hypothetical model	916.5	659	1.391	0.859	0.862	0.763	0.850	0.052	< 0.001
Modified model	651.3	623	1.045	0.985	0.985	0.829	0.983	0.983	0.209

Df: Degree of freedom; CFI: Confirmatory fit index; IFI: Incremental fit index; GFI: Goodness of fit index; TLI: Tucker–Lewis index; RMSEA: Root mean square error of approximation

The highest correlation coefficient was related to the relationship between depression and self-esteem. In order to investigate the effective factors in depression in patients with MS, the normalized modeling approach has been used (Table 1).

The quality of the SEM was measured on the proper equality between the data and the hypothesized model. In table 2, Fitness indices represent the weak fit of the hypothesized model with the data. In other words, the values of most indicators indicate that the model needs to be corrected. To this end, according to the output of the initial model, the direct effect of stress on the mind awareness and the error of some of the observable variables associated with each structure were linked together. The results of the modified model showed that fitness indices indicated the optimal fit of the modified research model with data. Therefore, the modified or finalized model had acceptable fitness. Comparison of the indexes of the hypothesized model with the modified model confirmed the improvement of the final model to the hypothesized model.

The direct effect coefficients and total effect are given in table 3. So, based on standard coefficients, the direct effects of stress on depression (β = 0.201, P = 0.252), self-esteem on depression (β = -0.385, P = 0.108), and the effect of mindfulness on depression (β = -0.336, P = 0.122) were significant. Also, the effect of each of the stress (β = 0.267, P = 0.024), self-esteem (β = -0.399, P = 0.103), and mindfulness (β = -0.367, P = 0.110) variables was significant on depression. To test the indirect paths, Sobel test and percentile bootstrap test were used. Due to the low volume of the research sample, the percentile bootstrap test was used because it has high power and reduces the type-1 error.

Table 3. Direct effect and the total effect of predicted variables on the criterion variable

Tested path	Direct effect	Total effect
Stress on depression	0.201[*]	0.267[*]
Self-esteem on depression	-0.385[*]	-0.399[*]
Mindfulness on depression	-0.336[*]	-0.367[*]

[*] P < 0.010

The indirect path test results with two intermediate variables are reported in table 4. So, for the effect of stress on depression through self-esteem, the lower limit of the confidence interval (CI) was 0.052 and the upper limit was 0.212. For the effect of self-esteem on depression, through the mindfulness, the lower and upper limits of CI were -0.175 and -0.031, respectively. Given that in both cases, zero is placed outside these CIs, these indirect paths are significant. Therefore, the mentioned model indicates the role of interpersonal self-esteem in the relationship between stress with depression and the role of mindfulness in the relationship between self-esteem and depression.

Table 4. Estimation of the indirect path of the model by using percentile bootstrap

	Parameters	β	Percentile bootstrap 95% CI		
Indirect path			Low	Up	P
The effect of stress on depression with mediator of self-esteem		0.127	0.052	0.212	0.010
The effect of self-esteem on depression with mediator of mindfulness		-0.106	-0.175	-0.031	0.011

CI: Confidence interval

Figure 1 shows the direct and indirect pathways of the variables related to the factors influencing depression in patients with MS. According to the present model, 0.41% of depression changes in these patients are explained by three variables: stress, mindfulness, and self-esteem.
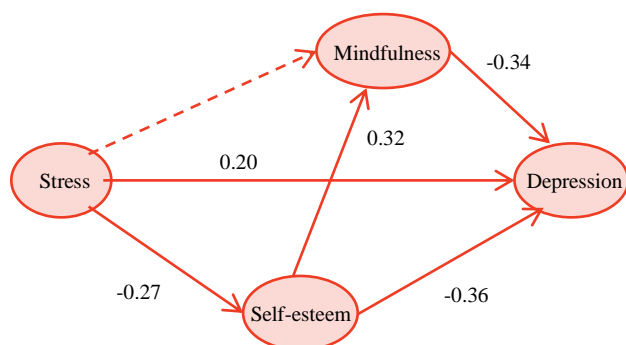
Figure 1. Corridor path coefficients of modified structural research model (dashed lines: deleted path)

Discussion

The purpose of this study was to investigate the relationship between stress, self-esteem, mindfulness, and depression in the form of SEM. The results indicate that assessment of variables relationship as latent variables is stronger than assessing one as an observed variable. This finding challenges the results of research in this field, which sought to investigate this relationship through correlation coefficient based on classical methods of measurement. Structural analysis results showed that stress had a direct positive and significant effect on depression in patients with MS. This finding is consistent with studies conducted by Admon et al.,[8] Pechtel et al.,[9] and Anens et al.[22] In explaining the role of stress on depression, research literature emphasizes the role of biological components. Clinical and paraclinical studies suggest that repeated stresses are responsible for structural and functional changes in specific areas, including prefrontal cortex,[23] which ultimately leads to depression. In addition, self-esteem has

a direct effect on the depression of these patients.

These results are consistent with studies by Orth et al.[16] and Bajaj et al.[17] that emphasize the role of self-esteem in depression. The nature of MS is associated with low levels of self-efficacy due to various symptoms and complications[24] and self-esteem of these patients.

Kivimaki and Kalimo[10] argue that individuals with low self-esteem show maladaptive coping styles in confronting life-stressing situations that lead to uncontrollable perceptions of the environment, and the consequence of this low self-esteem is depression. Another finding of this study is the direct effect of mindfulness on the depression of patients with MS. In the literature, the findings are related to Petrocchi amd Ottaviani[23] and Desrosiers et al.[25] In explaining this finding, it can be said that mindfulness in individuals leads to an unresponsive attitude toward distressing thoughts and feelings, which is associated with a reduction in depressive symptoms.[20]

The results of percentile bootstrap show that the indirect effect of stress on depression through self-esteem is significant. These findings suggest that self-esteem is associated with stress and depression simultaneously and plays a mediator role in this regard. The indirect effect of stress on depression is less than the direct effect, which indicates that this is the observed relationship between stress and depression influenced by a third variable called self-esteem. Contrary to what was suggested in the conceptual model of research, mindfulness was not able to play a mediating role in the relationship between stress and depression. In explaining this finding, since the self-report tool was used to measure patients' mindfulness, the non-correlation can be attributed to the inadequacy of the information gathering tool. As a result, in future research, the use of other information gathering tools including interviewing, is necessary to achieve more accurate results. Also, the findings indicated that mindfulness

played a role of intermediate between self-esteem and depression. This result is consistent with the studies by Bajaj et al.[17] In explaining this finding, it can be said that high mindfulness encourages people to keep attention for the experiences of the present, making them less involved with negative beliefs or critical thoughts. As a result of increased consciousness, self-esteem will also increases followed by depression. In general, the results of SEM showed that the hypothesized model of research had a good fit among people with MS, so that the variables in the research model explained 41% of variance of depression variable. Since one-way ANOVA results showed that gender had no significant effect on any of the variables used in the analysis ($P < 0.050$), it is possible to use these variables and the proposed model to identify the factors affecting the depression of these patients, regardless of their gender. Among the limitations of the present study, the low volume of sample members and the sampling method were available. It is suggested that other researchers use a random sampling method to increase the external validity of the research and its generalization of the results to the community of patients with MS in the country. 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 assumptions of models related to the relationship between research variables. At the practical level, the results of this study can be an empirical basis for developing educational, interventional, and therapeutic programs.

Conclusion

This study adds to the existing literature by providing SEM for depression in patients with MS. Based on the results of this study, effective factors in the depression of patients with MS should be considered for designing psychological intervention. In this context, the role of stress, self-esteem, and mindfulness are important.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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