

The Effect of an Education Program Based on Illness Perception on the Lifestyle of Patients with Metabolic Syndrome: A Randomized Controlled Clinical Trial

Mahnaz Rakhshan¹, PhD; Mitra Rahimi², MS; Ladan Zarshenas³, PhD

¹Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, Iran;

²Student at Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran;

³Department of Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

Corresponding Author:

Mahnaz Rakhshan, PhD; Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Zand Blv, Namazi Square, Postal code: 71936-13119, Shiraz, Iran

Tel: +98 71 36474254; Fax: +98 71 36474252; Email: mzrakhshan@ymail.com, rakhshanm@sums.ac.ir

Received: 18 May 2019 Revised: 22 July 2019 Accepted: 14 September 2019

ABSTRACT

Background: This study aimed to examine the effects of an education program based on illness perceptions on the lifestyle of patients with metabolic syndrome.

Methods: This is a randomized controlled clinical trial on 80 patients with metabolic syndrome referred to diabetic clinic affiliated to Shiraz University of Medical Sciences from August to November 2016. The patients were assigned to two control and intervention groups using a simple randomization method. The intervention group received education based on illness perceptions, using face-to-face and telephone follow up sessions in five weeks. The lifestyle questionnaire, brief illness perception questionnaire and demographic information questionnaire were used for data collection. The patients' lifestyle was examined before and at the end of the eighth week from the beginning of the intervention. Descriptive and inferential statistics were used for data analysis.

Results: After the intervention, the total lifestyle score in the intervention group significantly increased, as compared to the control group (14.60±6.85 vs 6.15±5.80) (P<0.001). Of all the lifestyle dimensions, only stress management after the intervention showed no significant changes (P>0.001).

Conclusion: Education based on illness perceptions affected the lifestyle of patients with metabolic syndrome. Therefore, nurses and healthcare providers can use this program for improving the lifestyle of patients with metabolic syndrome.

Trial Registration Number: IRCT2016020826437N1.

KEYWORDS: Illness perception, Lifestyle, Metabolic syndrome

Please cite this article as: Rakhshan M, Rahimi M, Zarshenas L. The Effect of an Education Program Based on Illness Perception on the Lifestyle of Patients with Metabolic Syndrome: A Randomized Controlled Clinical Trial. *IJCBNM*. 2019;7(4):279-287. doi: 10.30476/IJCBNM.2019.81658.0.

INTRODUCTION

Metabolic syndrome (Mets) is considered a risk factor for the development of cardiovascular diseases.¹ It is defined as a series of metabolic disorders, which poses the patient to many health-related complications. Prevalence of Mets is estimated to be 21.8% in the US,² and 31% in the Iran, respectively.³ Mets includes a group of metabolic disorders defined by at least three of the following factors: abdominal obesity; lipid disorders including high triglyceride and low high-density lipoprotein (HDL); hypertension; and high fasting blood sugar.⁴

Changing dietary and exercise-related behaviors may lead to a healthier waistline measurement and body mass index (BMI), improved values for HDL and triglyceride, lower BP, and lower blood glucose.⁵ Therefore, Mets and its components are closely associated with lifestyle and consequently, a change in lifestyle is required for improving the prognosis and symptoms of this disease, and behavior associated with the illness perception. Illness perception emerged as a result of our beliefs about illness and what it means in the context of our life. A person might have her/his own thoughts about what caused the illness, how long it lasted, how it affected her/his life, and how it could be controlled or cured.⁶ The education of the patient for changing his or her lifestyle based on educational needs can have significant impacts on the disease.⁷ In recent years, there has been an increasing interest in research with a focus on the relationship of illness perceptions and health-related outcomes in chronic disorders.⁸ Undoubtedly, data collection regarding the patient's illness perceptions helps with identifying the factors that influence the adaptability and acceptance of the disease process.⁹ According to the Leventhal's model, illness perceptions reflect the patients' own views about the cause of illness (beliefs about what have caused the disease), illness identity (beliefs about how the disease is perceived), illness consequences (impact of the disease on the quality of life, relationships and work), timeline (whether

the disease has a long or short duration or has cyclical onset of symptoms), and illness cure or control (whether the illness can be controlled by patient's behaviors or treatment modules).¹⁰

Illness perceptions have been used in some studies for improving the lifestyle of patients with chronic diseases.¹¹ A study showed that the telephone follow-ups of patients with myocardial infarction affected their lifestyle and illness perceptions after discharge from the hospital.¹² Another researcher reported that higher illness perception had a positive correlation with higher cardiovascular health behaviors.⁶ Given the importance of understanding illness perceptions and implementing educational interventions based on illness perceptions, as well as the importance of lifestyle issues in Mets, less attention has been paid to modifying or changing the lifestyle of these patients. Also, these two important concepts have not been considered in Iranian patients. Therefore, the present study aimed to examine the effects of an education program based on illness perceptions on the lifestyle of patients with Mets.

MATERIAL AND METHODS

This study was a randomized controlled clinical trial. The samples were 80 patients aged 20-70 years who had Mets and were diagnosed by an endocrinologist. They were referred to a diabetes healthcare center affiliated to Shiraz University of Medical Sciences and selected based on inclusion and exclusion criteria from August to November 2016. They were provided with explanations about the study's aim and their anonymity throughout the study. Written informed consent form was signed by those who willingly participated in this study.

The Health Promoting Lifestyle Profile (HPLP), brief illness perception questionnaire (BIPQ), and demographic questionnaire were filled out by the patients. They were assigned to the intervention and control groups, using the simple randomization method via the table of randomized numbers. For blinding,

randomization was performed by the researcher assistant. Inclusion criteria were being willing to participate in the study, being able to read and write in Farsi, and having no known acute psychological diseases. Lack of willingness to participate in this study and absence from at least one education session led to the exclusion of the patients. Given $\alpha=0.05$, $\beta=0.1$, $\mu_1=22.54$, $\mu_2=30.17$, $\sigma_1=2.7$, $\sigma_2=3.42$ and using a sampling formula, the number of samples was estimated 80 patients within 15 percent drop-out rate (Figure 1).¹³

$$N = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_2 - \mu_1)^2}$$

$$N = \frac{(01.96 + 0.84)^2 (2.7^2 + 3.42^2)}{(22.54 - 30.17)^2}$$

The demographic questionnaire, HPLP and the BIPQ were used for data collection. The demographic questionnaire was designed using a review of literature and the supervision of an endocrinologist. It contained 12 questions concerning personal and therapeutic characteristics. The HPLP was designed by Walker and Pender, which contained 52-items (with a 5-point Likert scale) about lifestyle behaviors as follows: health responsibility (9 items), exercise (8 items), interpersonal support (9 items), spiritual growth (9 items), nutrition (9 items), and stress management (8 items). The overall score was 208 that was divided into four categories of weak (less than 52), medium (53-104), good (105-156) and excellent (157-208). In terms of the psychometrics properties of HPLP, content validity index (CVI) was reported as 0.82 and alpha reliability coefficient for the total scale was 0.93 and 2-week test-retest

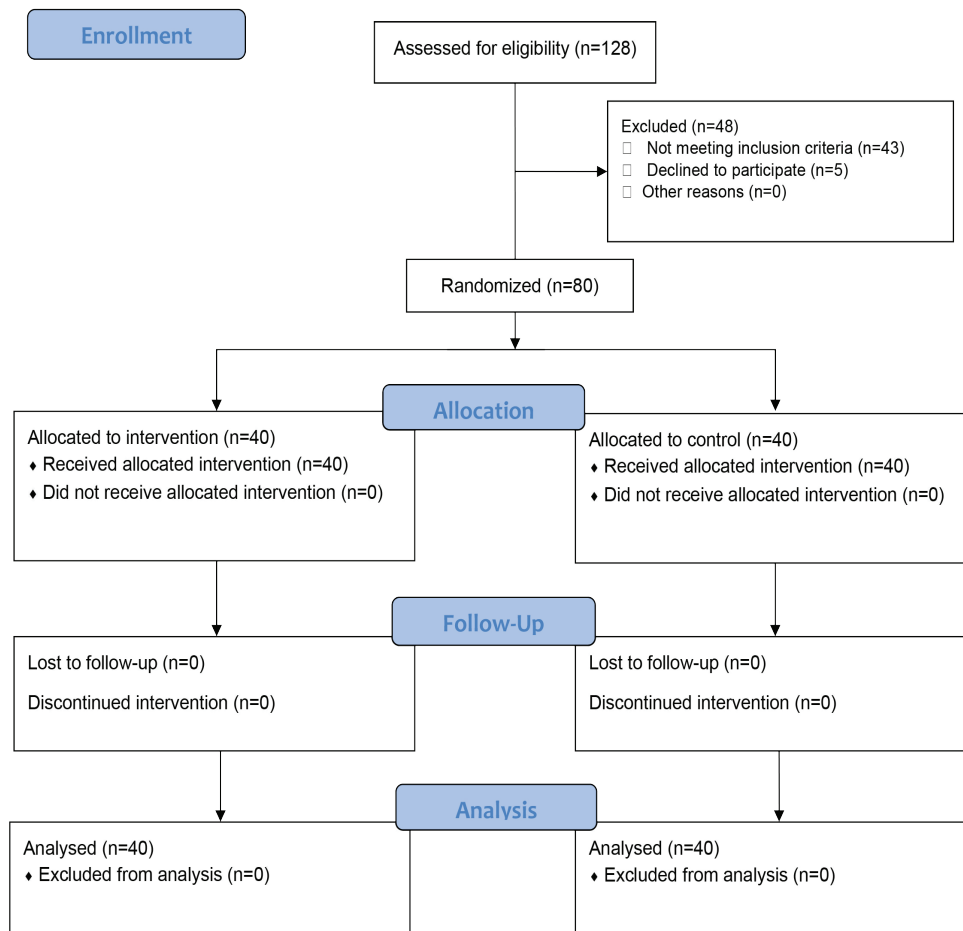


Figure 1: CONSORT Flow Diagram of participants

reliability was 0.86; alpha coefficients for the subscales ranged from 0.70 to 0.87. In a principal components factor analysis, all items were loaded significantly on six factors and explained 45.9% of the variance in the measure. Second-order factor analysis yielded a single factor, interpreted as health-promoting lifestyle. The alpha reliability coefficient for the total scale was 0.93 and 2-week test-retest reliability was 0.86; alpha coefficients for the subscales ranged from 0.70 to 0.87.¹⁴ The Cronbach's alpha coefficient of this questionnaire in Iran was reported 0.83.¹⁵ Besides, the CVI of this questionnaire was reported 0.80-0.88. The initial confirmatory factor analysis (CFA) was used. The CFA of the HPLP yielded a good estimate of fit ($\chi^2=6.34$, $df=2$, $P=0.420$, $CFI=0.99$, $NFI=0.99$, $RMSEA=0.066$). All factors were significantly loaded on their respective latent factors (0.60–0.73 in lifestyle, 0.57–0.98 in N, 0.57–0.88 in HR, 0.44–0.82 in PA, and 0.61–0.94 in SM and SG). All items showed load factor above 0.40 averagely.¹⁶

The BIPQ was used for examining illness perceptions based on a nine-item scale. Items 1-8 were scored based on a 10-item Likert scale (0-1 never or rarely, 2-3 very little, 4-6 average, 7-8 a lot or severely, and 9-10 very severely). Item 9 was an open-ended question, which required the patients to mention three of the most important causal factors of their illness. The scores of items 1, 2, 5, 6, 7 and the converse scores of items 3, 4, 7 were summed. The score of this questionnaire was reported based on a 0-10 scale with higher scores, indicating the person's higher illness perception.¹⁷ Criterion validity of this questionnaire was reported 0.75-0.82 and internal reliability, using the calculation of the alpha Cronbach coefficient, was reported as 0.79-0.89.¹⁸ In Iran, content validity index was reported 0.83-0.91 and Cronbach's alpha coefficient was reported as 0.68.¹⁹ Construct validity of Farsi version of BIPQ was done by using confirmatory factor analysis. The data showed goodness of fit indexes, indicating a good fit between the hypothesized model and

the observed data: RMSEA was 0.04, which is considered to indicate good fit. Values of GFI and AGFI were both more than 0.90. The closer to 1.00 values of absolute indexes of GFI and AGFI are, the better the model fits to the data fit. Also, $CFI=0.99$ $NNFI=0.98$, and $ECVI=0.19$ and were appropriated.²⁰

The research was conducted on the intervention and control groups. The intervention was performed for the experiment group, lasting for five consecutive weeks as follows: face-to-face sessions lasted between 45-60 minutes in the first three weeks and telephone follow-ups in the fourth and fifth weeks. The control group received routine education including one session of informal education regarding Mets (Table 1). Educational content was based on six concepts of illness perception (including identity, cause, timeline, consequences, cure and control). Therefore, the core content of educational program was the same for all, but according to the respondents' answers to the BIPQ, the emphasis and priority of the education on these concepts varied for each patient. Educational content was compiled and confirmed by research team members and assessed by 2 physicians and 2 nurse experts. According to the priorities of his/her educational needs, they were divided into eight groups of four-five patients. Educational sessions were held with the presence and supervision of the second author. In the third session, the concepts of stress control were described with the presence of the second author and assistance of a clinical psychiatrist.

The duration of each intervention program was approximately 5 weeks. Since 8 groups of four-five patients participated in the intervention program and in order to coordinate the time of completing the questionnaire, at the end of the eighth week from the beginning of the intervention, the lifestyle questionnaire was completed by the members of both groups. At the end of the study, the educational pamphlet was also given to the control group due to ethical considerations. All participants in this study

Table 1: The Educational content

| Sessions | Content | Method | Time |
|----------|---|--|------------------------|
| First | Explaining the identity and cause of the disease | Holding a meeting as a lecture and providing questions and answers | Duration 45-60 minutes |
| Second | Explaining the methods of cure and control of the disease (Emphasis on nutritional methods and effective physical activity) | | |
| Third | Explaining individual control methods (Emphasis on stress control). | | |
| Fourth | Answering patient questions, discussing the nutritional method taught to the patients | | |
| Fifth | Answering patients' questions, discussing on physical activity and how to rest | | |

Emphasis of the content was on the educational priorities based on the patients' illness perception.

benefited from the educational material provided to the intervention group.

Descriptive and inferential statistics were used for data analysis through SPSS software version 19. Paired t-tests and independent t-tests were performed to examine the lifestyle and demographic data. Also, the Chi-square test was conducted to analyze qualitative demographic data. Statistical significance was set at 0.05.

Ethical approval and permit of access to diabetes healthcare center was obtained from Shiraz University of Medical Sciences. The participants were informed and written consent was obtained before their participation in the study. Data confidentiality and anonymity was guaranteed for volunteers participating in the study. This study was approved in Shiraz University of Medical Science with ethical code of [IR.SUMS.REC.1394.137].

RESULTS

The findings showed that there was no statistically significant difference between demographic variables in the groups. The participant's demographic data are shown in Table 2. There was a statistically significant difference between lifestyle dimensions in the intervention group before and after the intervention. After the education program, in the intervention group the lifestyle score showed a statistically significant improvement ($P < 0.001$). In the control group, the lifestyle

score also increased after the intervention, but it was not statistically significant ($P < 0.001$).

The comparison of the mean difference in the score of lifestyle after the intervention in the groups showed a statistically significant increase in all aspects of lifestyle ($P < 0.001$) except for stress management in the intervention group compared to the control group ($P > 0.001$). Most changes were in nutrition (4.95 ± 3) and the least change was in spiritual growth (0.60 ± 0.96).

Table 3 showed mean differences in the scores of lifestyle dimensions in the intervention and control groups after the intervention. The score of each question in the BIPQ determined the educational content for patients.

The lowest mean score in the control group was understanding (4.58 ± 1.97) and in the intervention group, was personal control (5.45 ± 2.55). The highest mean score in the intervention group was concern about the illness (7.50 ± 2.90) and the higher scores in this question indicated higher integration and education in this area (Table 4).

DISCUSSION

This study was conducted on patients suffering from Mets. The effect of education based on illness perceptions on the lifestyle among patients with Mets was evaluated. Patients with Mets showed more positive changes in their lifestyle after the education intervention

Table 2: The Demographic characteristics of the study participants (N=80)

| Variable | Intervention group (n=40) | Control group (n=40) | P value |
|--------------------------|---------------------------|----------------------|---------|
| | Mean±SD | Mean±SD | |
| Age | 56.23±9.35 | 56.60±8.31 | 0.98* |
| Height | 165.43±8.00 | 168.33±7.27 | 0.11* |
| Weight | 75.13±9.16 | 77.40±8.09 | 0.20* |
| Systolic blood pressure | 11.45±148.55 | 11.06±151.40 | 0.15* |
| Diastolic blood pressure | 6.86±92 | 7.46±93.87 | 0.29* |
| Last Triglyceride | 37.31±190.60 | 39.15±188.85 | 0.75* |
| Last fasting blood sugar | 79.97±217.35 | 46.47±214.98 | 0.33* |
| | N(%) | N(%) | |
| Education level | | | 0.41** |
| Diploma | 36 (90%) | 39 (97.5%) | |
| Higher than diploma | 4 (10%) | 1 (2.5%) | |
| Gender | | | 0.24** |
| Female | 28 (70%) | 23 (57.5%) | |
| Male | 12 (30%) | 17 (42.5%) | |
| Smoking | | | 0.11** |
| Yes | 14 (35%) | 17 (42.5%) | |
| No | 26 (65%) | 23 (57.5%) | |
| Marriage | | | 0.55** |
| Yes | 32 (80%) | 34 (85%) | |
| No | 8 (20%) | 6 (15%) | |
| Job status | | | 0.18** |
| Practitioner | 16 (40%) | 22 (55%) | |
| Unemployed | 24 (60%) | 18 (45%) | |

*t-test; **Chi-square

Table 3: The differences in lifestyle dimensions mean difference scores after the intervention in both groups

| Group | Intervention | Control | Pvalue* |
|-----------------------|--------------------|--------------------|---------|
| Dimension | Mean difference±SD | Mean difference±SD | |
| Nutrition | 4.95±3.00 | 3.100±3.40 | 0.006 |
| Spiritual growth | 0.6±0.96 | 0.025±0.16 | >0.001 |
| Stress management | 2.65±2.73 | 3.025±2.93 | 0.72 |
| Exercise | 3.95±2.19 | 0.00 | <0.001 |
| Interpersonal support | 1.275±1.47 | 0.00 | <0.001 |
| Health responsibility | 1.175±1.26 | 0.00 | <0.001 |
| Total lifestyle | 14.60±6.85 | 6.15±5.80 | >0.001 |

*t-test

Table 4: The mean and standard deviation of illness perceptions in the groups

| Variable | Intervention group | Control group | P value* |
|---------------------------|--------------------|---------------|----------|
| | Mean±SD | Mean±SD | |
| Identity“q5 | 5.78±2.86 | 5.65±2.62 | 0.55 |
| Time line “q2 | 7.33±2.92 | 8.00±2.57 | 0.23 |
| Consequences”q1 | 6.13±3.09 | 6.28±2.66 | 0.14 |
| Personal control”q3 | 4.95±2.52 | 5.45±2.55 | 0.76 |
| Treatment control”q4 | 5.75±2.74 | 6.30±2.58 | 0.59 |
| Concern “q6 | 7.50±2.90 | 6.75±3.28 | 0.30 |
| Understanding“q7 | 5.03±2.25 | 4.58±1.97 | 0.34 |
| Emotional response “q8 | 6.75±3.16 | 5.83±2.00 | 0.72 |
| Total illness perceptions | 6.15±1.35 | 6.103±1.37 | 0.87 |

*t-test

compared with the control group and before the study. The findings of this study are in line with those of a research performed on the effect of education based on illness perceptions on nutrition, physical activity, and stress.^{21, 22} However, the data of a study was reported that illness perceptions had no significant effect on improving the lifestyle of patients with genital cancer,⁸ which was against the findings of the present study. A probable reason for the difference was variations in the samples. In the above-mentioned study, illness perceptions were examined in patients suffering from genital cancers; however, in the present study the samples included patients with Mets. Also in the present study, the priorities of the education intervention were determined individually based on illness perceptions, but in that study only the effects of illness perceptions were examined on lifestyle changes.

Some studies reported the positive effects of different interventions on the lifestyles of patients with cardiovascular diseases and Mets.^{7, 12} It was indicated that after educational interventions, statistically significant differences were reported in the scores of lifestyle dimensions, which were in line with the findings of the present study.⁵ The results of another study also confirmed the effects of an increase in the patients' awareness of the disease on lifestyle changes.¹³ Comparing the lifestyle dimensions among patients with Mets in the present study showed that the condition of patients with Mets was improved in the five dimensions of diet, spiritual growth, interpersonal communication, health responsibility, and physical activity after the intervention. In another study, the effects of education on the sports' motivation and physical activity were reported in patients with cardiovascular diseases.²³ In addition, the results of other studies also showed the effects of education on improving awareness and nutrition among the subjects.^{24, 25} However, in the intervention group, no significant changes in the dimension of stress management were reported. Another study examined the effects of telephone follow-ups on the lifestyle of

patients with myocardial infarction. The intervention did not have any significant effects on stress management.¹² Some other studies reported the positive effects of education on stress management among patients with Mets.²² This difference could be related to the differences in the type of educational intervention and participants, and the fact that different participants had different experiences with education. Future studies should focus on comprehensive interventions for identifying stress management factors among the patients. The present study did not show any significant relationship between demographic information and changes in lifestyle. However, the results of the study regarding the lifestyle of patients suffering from hypertension using a motivational interview showed that the variable of gender affected the lifestyle changes,²⁶ that was different from the findings of the present study. Perhaps such a difference can be attributed to the difference in participants, educational methods and types of education.

A limitation of the present study was that it was conducted only in one healthcare organization. Therefore, this study should be repeated in other healthcare settings with other samples. Also, the use of virtual educational methods is recommended to facilitate the patients' access to educational materials.

This study helped to improve the illness perception in the patients including the perception of identity, time, consequences, and causes of the disease. The differences in illness perception could develop a healthier lifestyle and control health conditions. The illness perception was based on a person's experience and practice, which created a person's illness perception that influenced the behavior for the improvement of lifestyle habits and development of healthier behaviors.

CONCLUSION

Education based on illness perceptions affected the lifestyle of patients with metabolic syndrome. Therefore, understanding illness perceptions of

patients was helpful for improving the lifestyle of patients with Mets. It is suggested that nurses and healthcare providers should design and implement the educational program based on the patients' illness perceptions to improve the lifestyle and health-related outcomes of patients with Mets.

ACKNOWLEDGEMENT

The present article was extracted from the findings of a master degree thesis of Mitra Rahimi that was supported by Shiraz University of Medical Sciences [grants NO. 7606]. Profound gratitude and deep regards are extended to the patients for their participation in the production of this article. Hereby, the authors would like to thank the Vice-chancellor for research affiliated with Shiraz University of Medical Sciences for financial support.

Conflict of Interest: None declared.

REFERENCES

- 1 Mottillo S, Filion KB, Genest J, et al. The metabolic syndrome and cardiovascular risk a systematic review and meta-analysis. *Journal of the American College of Cardiology*. 2010;56:1113-32.
- 2 Saklayen MG. The Global Epidemic of the Metabolic Syndrome. *Current hypertension reports*. 2018;20:12.
- 3 Dalvand S, Niksima SH, Meshkani R, et al. Prevalence of metabolic syndrome among Iranian population: a systematic review and meta-analysis. *Iranian journal of public health*. 2017;46:456-67.
- 4 Parikh RM, Mohan V. Changing definitions of metabolic syndrome. *Indian journal of endocrinology and metabolism*. 2012;16:7-12.
- 5 Yamaoka K, Tango T. Effects of lifestyle modification on metabolic syndrome: a systematic review and meta-analysis. *BMC Med*. 2012;10:138.
- 6 Nur KRM, Chinnawong T, Kritpracha CH. Illness Perception And Cardiovascular Health Behaviors In Persons With Ischemic Heart Disease: A Literature Review. *GSTF Journal of Nursing and Health Care (JNHC)*. 2017;4:18-22.
- 7 Sovárióvá Soósová M, Hrehová J. The effect of education on life style changes and metabolic syndrome components. *Cent Eur J Nurs Midw* 2014;5:161-8.
- 8 van Broekhoven M, de Rooij BH, Pijnenborg JMA, et al. Illness perceptions and changes in lifestyle following a gynecological cancer diagnosis: A longitudinal analysis. *Gynecol Oncol*. 2017;145:310-8.
- 9 Wiborg JF, Löwe B. Illness perceptions in patients with somatoform disorders: Examining the role of comorbidity. *Journal of Health Psychology*. 2015;20:1166-74.
- 10 Diefenbach MA, Leventhal H. The common-sense model of illness representation: Theoretical and practical considerations. *Journal of Social Distress and the Homeless*. 1996;5:11-38.
- 11 Evers AW, Kraaimaat FW, van Lankveld W, et al. Beyond unfavorable thinking: the illness cognition questionnaire for chronic diseases. *Journal of Consulting and Clinical Psychology*. 2001;69:1026-36.
- 12 Yan J, You LM, Liu BL, et al. The effect of a telephone follow-up intervention on illness perception and lifestyle after myocardial infarction in China: A randomized controlled trial. *International Journal of Nursing Studies*. 2014;51:844-55.
- 13 Rakhshan M, Kordshooli KR, Ghadakpoor S. Effects of Family-Center Empowerment Model on the Lifestyle of Heart Failure Patients: A Randomized Controlled Clinical Trial. *International Journal of Community Based Nursing and Midwifery*. 2015;3:255-62.
- 14 Walker SN, Kerr MJ, Pender NJ, Sechrist KR. A Spanish language version of the Health-Promoting Lifestyle Profile. *Nursing Research*. 1990;39:268-73.
- 15 Safabakhsh L. The effect of educational protocol based on penders theory on life style of patient after coronary artery

- bypass graft at Namazi, Faghihi, MRI hospitals. [thesis]. Shiraz (Iran): Shiraz University of Medical Sciences; 2004. [In Persian]
- 16 Mohammadian H, Ghannaei M, Kortdzanganeh J, Meihan L. Reliability and Construct Validity of the Iranian Version of Health-promoting Lifestyle Profile in a Female Adolescent Population. *International journal of preventive medicine*. 2013;4:42-9.
 - 17 Broadbent E, Wilkes C, Koschwanez H, et al. A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. *Psychology Health*. 2015;30:1361-85.
 - 18 Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. *Journal of Journal of Psychosomatic Research*. 2006;60:631-7.
 - 19 Bagherian Sararoodi R, Saneei H, Bahrami Ehsan H. The Relationship of History of Hypertension and Illness Cognitive Representation in Post-Myocardial Infarction. *Journal of Isfahan Medical School*. 2010;27:699-709.
 - 20 Bazzaziana S, Besharatb MA. Reliability and validity of a Farsi version of the brief illness perception questionnaire. *Procedia Social and Behavioral Sciences*. 2010;5:962-5.
 - 21 Chen SL, Tsai JC, Lee WL. The impact of illness perception on adherence to therapeutic regimens of patients with hypertension in Taiwan. *J Clin Nurs*. 2009;18:2234-44.
 - 22 Falkowski J, Atchison T, Debutte-Smith M, et al. Executive functioning and the metabolic syndrome: a project FRONTIER study. *Arch Clin Neuropsychol*. 2014;29:47-53.
 - 23 Park YH, Song M, Cho BL. The effects of an integrated health education and exercise program in community-dwelling older adults with hypertension: a randomized controlled trial. *Patient Education and Counseling*. 2011;1:133-7.
 - 24 Jeihooni AK, Hidarnia A, Kaveh MH, et al. Application of the health belief model and social cognitive theory for osteoporosis preventive nutritional behaviors in a sample of Iranian women. *Iran J Nurs Midwifery Res*. 2016;21:131-41.
 - 25 Elmer PJ, Obarzanek E, Vollmer WM, et al. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Annals of internal medicine*. *Annals of internal medicine*. 2006 ;144:485-95.
 - 26 Navidian A, Mobaraki H, Shakiba M. The effect of education through motivational interviewing compared with conventional education on self-care behaviors in heart failure patients with depression. *Patient Educ Couns*. 2017;100:1499-504.