

Predicting of perceived self efficacy in the amount of macronutrients intake in women with metabolic syndrome - 2012

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ABSTRACT

Introduction: Metabolic syndrome is a collection of metabolic disorders, which can increase the mortality rates from 20% to 80%. One of strategies to control the disease is the attention to the dietary habits. Compliance with proper diet is one of the major challenges in the management of this syndrome. Due to this fact, that the patient is responsible for the adjustment of the daily diet, it is important to identify the factors affecting the adoption of nutritional self-care. Besides, self-efficacy is considered as an important pre-requisite for this behavior because it acts as an independent part of the basic skills. This study was carried out with the purpose of determining the predictive role of perceived self-efficacy on macronutrients intake in women with metabolic syndrome. **Materials and Methods:** In this descriptive study with correlational nature in 2012, there were 329 patients with the metabolic syndrome. The patients were covered by Isfahan oil industry medical centers and selected by a systematic method. In order to gather information on perceived self-efficacy, the questionnaires constructed by the researchers were used and the validity and reliability had been confirmed by the calculation of content validity index and content validity ratio values and the indices of internal consistency and stability of the tool. The 24-h dietary recall questionnaire was also used for 3 days in order to investigate the nutritional behavior. The obtained data from the dietary recall questionnaire were analyzed by the N4 nutritional software. In this study, AMOS software version 16 was used for the structural model fitting by using the generalized least squares method besides the SPSS statistical software version 16. **Results:** These averages obtained from the results: 2512.37 kcal energy intake, 70.95 g protein, 420 g carbohydrates and 61.61 g of fat per day. The mean of perceived self-efficacy score was 47.89. The Pearson correlation coefficient was indicated a significant inverse relationship between the perceived self-efficacy and intake of macronutrients in the metabolic syndrome. The most direct effect of the coefficient of perceived self-efficacy was observed on fat and carbohydrate intake ($P < 0.05$ and $\beta = -0.592$) and ($P < 0.05$ and $\beta =$

-0.395). **Conclusions:** The amount of energy, carbohydrate, fat and protein were more than the recommended dietary allowances levels and the amount of self-efficacy was moderate. The present study showed that perceived self-efficacy provided a useful framework to understand and predict adherence to dietary self-care behaviors in patients with metabolic syndrome.

Key words: Macronutrients, metabolic syndrome, perceived social support

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INTRODUCTION

With the advent of new technologies in all aspects of human life and changes in life-style and behavior patterns of people, the context has been suitable for many chronic diseases such as metabolic syndrome. The term of metabolic syndrome was added to the Medical Dictionary about 15 years ago. It refers to a series of metabolic disorders that the simultaneous risk of them in an individual is greater than any of them alone.^[1] Metabolic syndrome is a branch of metabolic disorders, which is characterized by lipid abnormalities, hypertension, obesity and impaired glucose and insulin metabolism. It has been recognized as a precursor to cardiovascular diseases; type 2 diabetes mellitus and strokes.^[2] Metabolic syndrome is associated with overweight and obesity and on the other hand is a risk factor for cardiovascular disease and diabetes too.^[3,4] Nowadays, this syndrome is known as one of the major health problems and researchers believe that this syndrome increases the risk of mortality from cardiovascular disease and diabetes.^[5,6] So that, with the metabolic syndrome, the overall mortality increased from 20% to 80%.^[7] Because this syndrome is associated with an increased risk of 2.8-8 times the risk of developing, type 2 diabetes mellitus and with an increase of 1.5-6 times the risk of cardiovascular diseases.^[8] This syndrome has a high prevalence in Western and Asian countries. Sarrafzadegan study, in Iran showed that the prevalence of metabolic syndrome according to the Adult Treatment Panel III was 35.1% in females and 10.7% in males and was more common in urban than rural population.^[9] In addition, the prevalence of metabolic syndrome in Isfahan was 25.4% in urban and 21.7% in rural population.^[10] However, it is not clear the exact etiology of the metabolic syndrome and it is thought that the incidence is due to the synergistic of genetically metabolic and environmental effects including diet and physical activity.^[11,12] The nutrition and the diet play an important role in the prevention and control of this syndrome. However, the nutritional pattern is changing rapidly in the Middle East including our country in such a way that the Middle East is suffering from energy over-consumption and even more than other developing countries.^[13,14] Anyhow, this change can be created by the trend to saturated fat, cholesterol, sugary materials, energy-dense foods with attractive appearance but low nutritional value compounds, fatty or sugary snack foods and decreased fiber food that adds to the severity of the risk of non-communicable diseases.^[15] On the other hand, many of the risk factors for metabolic syndrome are directly influenced by nutritional factors, such as dyslipidemia (blood fat disorders), high blood pressure, diabetes, and obesity. Therefore, the role of nutrition is undeniable in this disease. Diet is one of the effective non-pharmacological strategies for metabolic syndrome. It is not easy to change and maintain, due to the complexity of the behavior.^[16] The health care providers should always remember an important fact that a non-drug treatment strategy, if they have no more value than drug treatments, they are equally effective in disease prevention and control in patients with metabolic syndrome. It should be noted that the diet had less prescriptive mode

and most of it will be the responsibility of the patient. In fact, 95% of controlling the disease is expected to be personally performed by the patient and thus, it requires extensive changes in the life-style. Therefore, this syndrome requires self-care behaviors throughout the lifetime.^[17,18] Nevertheless, most of the patients do not actually care about their nutritional instructions. For example, in Asian countries and other communities, just less than half of the patients accepted to use the proper diet as a part of their treatment.^[19] Meanwhile, some studies indicated that nutritional status of Iranian women is not in a good condition.^[20] Other studies were also indicating about the faulty eating habits in American countries, Syria and Japan.^[21-23] Some authorities believe that it is not enough to have knowledge about the metabolic syndrome alone to start, maintain self-care behaviors and ensure the long-term control.^[24] In other words, the relationship between knowledge, attitudes and practices (according to many studies) is not linear, direct, and simple.^[25] Available studies evidenced that despite the high nutritional awareness, the performance of the individual was unacceptable in this field. The studies of Azar Avaazeh and Alireza Ostaad Rahimi indicated that although the patients had high knowledge and awareness, but had many incorrect nutritional behaviors.^[26,27] The study of Sayed Saeid Mazloomi also showed that there was no correlation between the awareness and prevention of diabetes.^[28] A similar situation was seen in Alireza Shahaab Jahaanloo Research.^[29] Thus, nutritional behavior is not only affected by the nutritional knowledge and can be influenced by several factors. Nowadays, there are evidences that one of the factors in the care of patients with chronic diseases is the self-efficacy. Self-efficacy is an important pre-requisite of this behavior because it acts as an independent part of the basic skills. It should be noted that the role of self-efficacy in the initiation and maintenance of the care behaviors, has been shown by several studies in other subjects too.^[30,31] Self-efficacy means the faith that a person has to himself in order to perform a particular behavior successfully and expected to observe its results. Today, self-efficacy is considered as an important behavioral pre-requisite because it acts as an independent part of the basic skills. Self-efficacy is an important concept that is derived from social cognitive theory, which refers to a person's beliefs and judgments of the ability to perform tasks and duties. The designer of this theory believes that the human beings have a self-control system and by its using they are able to control their thoughts, feelings and behavior and will play a decisive role in their fate.^[32] Therefore, this study was carried out in order to determine the predictive role of perceived self-efficacy on macronutrients intake in women with metabolic syndrome.

MATERIALS AND METHODS

This study was a descriptive research with correlational nature. The cross-sectional survey was conducted with the study population of women with metabolic syndrome in Isfahan. The samples were selected systematically from the available list of patients with metabolic syndrome (a collection that is

associated with the metabolic disorders caused by increased triglycerides decreased High-density lipoprotein, truncal obesity, hypertension and hyperglycemia). The patients were covered by medical centers of Isfahan oil industry in 2012. The inclusion criteria were the followings: Marital status, literacy (reading and writing) and at least 3 months passing from their infection to the syndrome. The exclusion criteria were also included: Being pregnant, genetic diseases, chronic infection or severe disease, age less than 35 years and more than 60 years, no surgical experience in the last 3 months and certain mental diseases. Sampling in this study was performed by the available sampling method. They were selected among patients in the five treatment centers of Isfahan oil industry in a 3-month time frame. In order to fit the structural equation modeling, in compliance with the 80% power, 5% significance level, the degrees of freedom of 30 and a maximum of 5% root mean square error (RMSE), 329 subjects participated in the study.^[33] Two questionnaires were used for data collection:

1. A researcher made questionnaire based on the health promotion pattern, which the reliability and validity were confirmed in a separate stage after the design. Therefore, at first 24 questions were designed in order to build the self-efficacy questionnaire as a part of the main tools of nutritional behavior. After calculating the parameters of content validity index and content validity ratio, those questions were removed with the amount of less than 0.75^[34] and the internal consistency index calculation (0.90) was performed. The stability of the tool was performed by the test of the re-test with a 2-week interval ($P < 0.001$, Interclass coefficient =0.924). This questionnaire was adjusted to 10 questions. These questions were designed as a 10-choice score with the range of 10-100.
2. As well, to investigate the nutritional behavior of the samples, the 24-h dietary recall questionnaire was used for 3 days. (2 days normally, and 1 day as a break). In order to assess the diet, the amounts listed for each meal were converted to g by using the household measuring guide. Each food was coded according to the Nutritionist IV (N4) program and was entered in this program due to the recommended instruction to evaluate the amount of energy and nutrients.

In order to comply with ethical considerations, the data were collected ultimately confidentiality, without including the individual characteristics, with patient awareness and the needed arrangements made by the Isfahan University of Medical Sciences, as well as the Pharmaceutical and Medical Deputy of Isfahan Oil Industry. The study was conducted using two statistical software of SPSS version 16 and AMOS version 16. The statistical methods used in the study were the frequency distribution, the mean and standard deviation reports, correlation matrix of the original variables and the structural equation model fit. By using the structural equation model fit results, the patterns of relationship and interaction (direct and indirect) between the perceived self-efficacy on the final outcome (mean intakes of macronutrients) were evaluated in terms of the health

promotion model. The structural model was fitted the method of Generalized least square. The most important indices to evaluate the adequacy of the model included Chi-square test, goodness of fit index (GFI), comparative fit index (CFI) and RMSE.

RESULTS

The mean age of the patients was 44.81 ± 8.04 years and the average duration of suffering this syndrome was 2.05 ± 0.88 years. 1.2% (four patients) had primary education, 8.2% (27 patients) elementary school, 56.2% (185 patients) secondary school and 34.3% (113 patients) had a university education. In addition, 41.3% (136 cases) were employed and 58.7% (193 cases) were housekeepers. The mean of perceived self-efficacy score regarding nutritional behavior in this study was 47.89 ± 20.36 . They were presented in Table 1 by the separation of the ten questions.

The mean energy intake in this study was: 2512.37 ± 344.21 kcal, 70.95 ± 27.22 g of protein, 420 ± 89.28 g carbohydrates, and 61.61 ± 20.16 g fat per day. The correlation matrix between the perceived self-efficacy and the intake of macronutrients were presented in Table 2.

Path analysis was used in order to determine the predictive ability of perceived self-efficacy regarding the macronutrients intake by the maximum probability estimation method. According to Table 3, the related indexes were examined and each was determined based on the theoretical model (Chi-square test, fit index, adjusted GFI, normed fit index, CFI, Root mean square residual and RMSE of approximation). Then, based on the paths given by the Modified Indices and scientific evidences, some paths were suggested to improve the model fitting. The amount of each of the parameters listed in Table 3. The results showed that the final model has an appropriate fitness and Figure 1 is expressing this item schematically.

The results showed that the perceived self-efficacy had a significant and inverse relationship with the effective intake of macronutrient in the metabolic syndrome. Therefore, the relationship between the self-efficacy with fat and carbohydrate intake was higher ($P < 0.05$ and $\beta = -0.592$) and ($P < 0.05$ and $\beta = -0.395$). The remaining information was presented in Table 4 regarding direct, indirect, and total self-efficacy on the entire macronutrient intake.

The final model showed that the perceived self-efficacy along with other studied structures could predict the changes of 72% in energy, 67% in protein, 74% in carbohydrate and 94% in fat modifications.

DISCUSSION

Nowadays, it has been recognized that the intake balance of macronutrients (carbohydrates, fats, proteins), is among the most important health factors and excessive intake of each

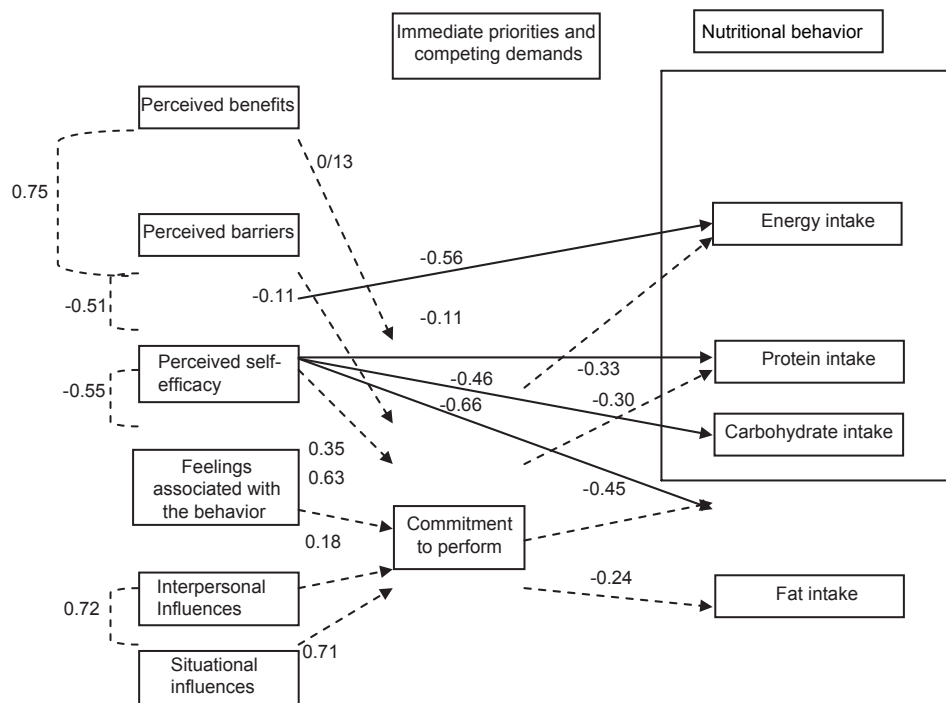


Figure 1: Diagram of path analysis to predict macronutrient intake in the final model

Table 1: The mean and frequency distribution of perceived self-efficacy questions scores regarding the nutritional behavior in the studied group

Perceived self-efficacy questions	1	2	3	4	5	6	7	8	9	10	Mean (SD)
1 Ensure the ability to change in the diet	5.8 (19)	2.1 (7)	21 (69)	31 (102)	7.9 (26)	12.2 (40)	11.6 (38)	1.2 (4)	0 (0)	7.3 (24)	4.72 (2.17)
2 Ensure the control of meals	5.8 (19)	2.1 (7)	29.8 (98)	0.3 (1)	28 (92)	25.5 (84)	0 (0)	1.2 (4)	0 (0)	7.3 (24)	4.76 (2.11)
3 Ensure the control of diet at parties	5.8 (19)	1.8 (6)	24 (79)	6.4 (21)	46.5 (153)	7 (23)	0 (0)	1.2 (4)	0 (0)	7.3 (24)	4.64 (1.99)
4 Ensure the ability to reduce the amount of food consumed at each meal	5.8 (19)	1.8 (6)	23.7 (78)	9.1 (30)	35 (115)	4.6 (15)	11.6 (38)	1.2 (4)	0 (0)	7.3 (24)	4.82 (2.13)
5 Ensure the diet control every day	5.8 (19)	1.8 (6)	23.7 (78)	9.1 (30)	35 (115)	4.6 (15)	0 (0)	12.8 (42)	0 (0)	7.3 (24)	4.94 (2.27)
6 Ensure waiver to enjoy other foods	5.8 (19)	1.8 (6)	23.7 (78)	0.3 (1)	48.3 (159)	11.6 (38)	0 (0)	1.2 (4)	0 (0)	7.3 (24)	5.00 (2.25)
7 Ensure following a diet without the support of others	5.8 (19)	1.8 (6)	23.7 (78)	3 (10)	41 (135)	4.6 (15)	0 (0)	12.8 (42)	0 (0)	7.3 (24)	5.00 (2.25)
8 Ensure food consumption with a bad flavor	5.8 (19)	1.8 (6)	23.7 (78)	9.1 (30)	46.5 (153)	4.6 (15)	0 (0)	1.2 (4)	0 (0)	7.3 (24)	4.59 (2.98)
9 Ensure the choice of healthy food in every situation	5.8 (19)	1.8 (6)	23.7 (78)	9.1 (30)	46.5 (153)	7 (23)	0 (0)	1.2 (4)	0 (0)	7.3 (24)	4.66 (1.98)
10 Ensuring the choice of healthy food, even faced with disagreeing	5.8 (19)	1.8 (6)	21.3 (70)	9.1 (30)	28 (92)	14 (46)	11.6 (38)	1.2 (4)	0 (0)	7.3 (24)	4.96 (2.13)

SD = Standard deviation

of these compounds are effective in causing metabolic syndrome. Since the previous studies have also suggested about the influence of diet on metabolic syndrome,^[35-38] macronutrients intake was also investigated in these patients in this study. The results indicated that macronutrients

intake in these patients was more than the Recommended Dietary Allowances. However, their suffering from metabolic syndrome could also be the expression of the same subject. The mean energy intake was 2512.37 kcal/day in this study similar to Mayer-Davis, Eeley and Rivellese, studies.^[39-41]

This amount suggested that the patients did not pay attention to the appropriate diet due to their disease. Energy intake in diabetic patients in the study of Mirmiran,^[42] Shirinzadeh,^[43] and Cruz and Calle-Pascual^[44] were confirmed these results too. Protein intake was 70.95 g/day in this study. The same situation could be observed in the study of Rezaei,^[45] Tazakori,^[46] and Golzarand,^[47] which was far more than the recommended amount. The findings showed that the carbohydrate and fat intake was significantly higher in these patients. Studies of Mayer-Davis^[39] Ebrahim Mamaghani,^[48] and Kushner,^[49] also have expressed similar conditions. In the study of Ghanaadi, original bread was the main complex source of food in 100% of individuals and rice consumption was found in 94.7% of the studied population.^[50] Previous researches have also shown that bread and rice are the two main sources of Iranian energy production.^[51] In addition, other studies showed that the consumption of fat has been doubled in our country over the past 30 years. These findings expressed this fact that the diet in metabolic syndrome patients needed to be changed and reformed. Therefore, according to previous studies, a modification is required in 73% of the Iranian's diet.^[52-55] Anyhow, in our country there was 40% more than the required amount of the consumed food, and carbohydrates and fat were 40% and 30% higher than needed, respectively.^[56] Studies have shown that life-style changes are associated to reduce metabolic syndrome in adults by physical activity, quitting smoking and unhealthy eating habits, particularly fat and high-carbohydrate diets.^[57] Due to this fact that high-energy-dense diets are contained higher amounts of fat, refined grains, added sugar and smaller amounts of fruits, vegetables, whole grains, and dietary fibers.^[58-61] In the study of Mendoza has proven that higher dietary energy density was significantly associated with a higher risk of metabolic syndrome.^[62] In this study, the researchers

interested to self-efficacy. It seems that regarding the problems that are associated with changes in life-style self-efficacy is important, such as to follow a healthy eating behavior, which is a complex behavior. With regard to the importance of personal, behavioral and environmental factors in the control of metabolic syndrome, self-efficacy is an important factor for promoting nutritional self-care behaviors. Self-efficacy has a strong effect on the health behaviors and in some studies; self-efficacy was accounted for over 50% of the variance in health behaviors.^[63-65] The results of the present study showed that the perceived self-efficacy in patients with metabolic syndrome has been in the modest circumstances. In other words, there was not sufficient confidence in their ability to track the behavior of people with healthy food. Results of other studies suggested that the self-efficacy in individuals with metabolic was not desirable. The studies of Bernal^[66] and Littlefield^[67] showed that these patients' self-efficacy was moderate to poor. Studies also suggested that within our country, the self-efficacy was not desirable in diabetic patients. The study of Keshavarz indicated that the target group of women did not have sufficient self-efficacy for a healthy diet.^[68] The studies of Borhani,^[69] Shakibazadeh,^[70] Mazloomi,^[28] and Morovvati,^[71] also showed similar results to this study. It has been shown in the study of Morovvati that the participants gained an average score of 59.9% on the self-efficacy of acquisition. Sarvestani study has also demonstrated that self-efficacy were low in 53% of the patients and 36% of them were with moderate self-efficacy.^[72] Even in the study of Shahab Jahanloo, self-efficacy was found to be in its lowest.^[29] However, some studies showed different results, such as in the study of Charron-Prochownik^[73] and Asad Zandi.^[74] Self-efficacy was in a relatively desirable condition, but equally the self-care behaviors were not acceptable. The results showed that there was a significant inverse relationship between the perceived self-efficacy and energy, protein, carbohydrate, and fat intake during the day. However, this relationship was much more between self-efficacy and higher fat and energy intake. This means that the higher perceived self-efficacy resulted lower macronutrients intake by affecting the metabolic syndrome and vice versa. In other words, the lower the perceived self-efficacy, the weaker is the nutritional self-care. (The direct relationship between self-efficacy and self-care nutritional). Heisler,^[75] Brown,^[76] Sousa,^[77] and Xu,^[78]

Table 2: Correlation matrix between the perceived self-efficacy and the intake of macronutrients in the studied group

Studied variable	Received energy	Received protein	Received carbohydrate	Received fat
Perceived self-efficacy				
<i>r</i>	-0.646	-0.219	-0.632	-0.701
<i>P</i>	<0.001	<0.001	<0.001	<0.001

Table 3: The value of model fitting in the path analysis in order to predict the intake of macronutrients in the studied group

Model fit index	Recommended value	The theoretical model	A final model	Conclusions
Chi-square statistic	<0.05	0	0.965	Fitted
Degrees of freedom of the Chi-square statistic	<3.00	0.061	0.012	Fitted
Goodness of fit index	<0.90	0.922	0.998	Fitted
Adjusted goodness of fit index	<0.80	0.5	0.920	Fitted
Normed fit index	<0.90	0.818	0.996	Fitted
Comparative fit index	<0.90	0.818	0.953	Fitted
Root mean square residual	<0.09	0.282	0.025	Fitted
Root mean square error of approximation	<0.10	0.217	0.045	Fitted

Table 4: Direct, indirect and total impact coefficients of perceived self-efficacy on energy, protein, carbohydrate and fat intake per day in the target group

Variables	Direct impact	Indirect impact	Total impact
Energy intake	-0.024	-0.022	-0.046
Protein	-0.024	-0.022	-0.046
Carbohydrate	-0.395	-0.040	-0.435
Fat	-0.592	-0.054	-0.646

showed that there was a significant positive correlation between psychological variables, particularly the self-efficacy, self-management, and diabetes self-care. In the study of Chao, was also confirmed the relationship between self-efficacy and self-care in patients with diabetes.^[79] Bonds *et al.*, have been performed a study in America in diabetic patients and found a significant relationship between self-efficacy and self-care.^[80] In another study that examined the behaviors of diabetic diet, a significant correlation was reported between self-efficacy and eating behaviors.^[81] The studies of Bernal,^[66] Wen,^[82] and Kavanagh,^[83] were also found a direct significant relationship between self-care and self-efficacy. The results were similar with the results of Walker.^[84] Bernal examined the correlation between self-care and self-efficacy in diabetes in Spanish adults. He concluded that self-efficacy had a relationship with diet self-care.^[66] Wen also observed in their study that the increased self-efficacy is best to follow a healthy diet.^[82] Stuijbergen *et al.*, also found that increased self-efficacy was associated with improved health behaviors and promoting this behavior.^[85] Krichbaum and Norris also showed that the self-efficacy had a positive impact in diabetic patients care behaviors.^[86,87] Tan also showed a significant correlation between self-efficacy and care behaviors in Chinese patients with type 2 diabetes mellitus.^[88] In the study of Mazloomi, the perceived self-efficacy had the highest correlation with of preventive behaviors for type 2 diabetes mellitus. In this study, by increasing self-efficacy, there was greater adherence to recommended activities.^[28] Based on the path analysis results, perceived self-efficacy could predict the amount of macronutrients [Table 4 and Figure 1]. The studies of Walker and Von *et al.* were also expressed the prediction of self-efficacy. For the nutritional behaviors and according to the regression analysis,^[84,89] the study of Hosein nejad also showed that there was a positive correlation between dietary behavior and self-efficacy score according to the two-variable regression.^[90] The perceived self-efficacy in the study of Mazloomi had the most correlation with preventive behaviors for type 2 diabetes mellitus.^[28] Shakiba zadeh also indicated that self-efficacy had a direct and significant relation with self-care and 51% of the self-care related changes could be explained by self-efficacy and the perceived barriers.^[70] Among the limitations of the study, it should be noted that the data for this study were collected as self-reported, which could not be a detailed description of the variables that were reported. The other limitation of the study was that it was a cross-sectional study, which made it

difficult to determine the causal relationship. In contrast, performing the path analysis with the optimal number of samples along with the standard tools was one of the strength points of the study.

CONCLUSIONS

In general, it can be concluded that high self-efficacy is enhanced for the orderly conduct of a particular behavior, desire to perform behavior, persistence and follow-up behavior during the time. Another explanation can be that people with strong self-efficacy (those who set higher goals for themselves) expect desirable outcomes. They look at the obstacles and problems as challenges to overcome self-management and therefore, they do more self-management actions. This review, which referred to the perceived self-efficacy in predicting the dietary intake of macronutrients, showed that self-efficacy provided a useful framework to understand and predict adherence to dietary self-care behaviors in patients with metabolic syndrome. In general, nutritional self-care is important in the treatment and control of chronic diseases such as metabolic syndrome and it is expected that patients do 95% of control of the disease personally. A major part of the patient's care is at home and self-efficacy is very important at this time. Self-efficacy directly (through efficacy expectations) is an incentive for health-promoting behaviors and can indirectly affect the motivation through perceived barriers and the level of commitment or loyalty to keep track of the performance plan.

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