Original Article

The Effect of Collaborative Care on Blood Glucose and the lifestyle of women with Gestational Diabetes attending to health centers in Hamadan during 2017-2018

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ABSTRACT

Background: Diabetes is one of the most common medical problems during the pregnancy, resulting in harmful effects on fetuses, infants and mothers. Many of the problems of diabetic people are caused by unhealthy lifestyle. Thus, in order to control the disease and reduce its complications, modification of the lifestyle is necessary. In the present study, the effect of collaborative care on blood glucose and lifestyle in women with gestational diabetes referring to the clinics of Hamadan Health Centers in 2018-2019 was evaluated. Methods: This study was a clinical trial conducted with pre-test and post-test on 60 women with gestational diabetes in Hamadan during 2017-2018. The samples were divided into two groups of experimental (n = 30) and control (n = 30) through the even and odd numbers. Data were collected by a two-section questionnaire including demographic characteristics and health promoting lifestyle questionnaire with 52 items in two stages of before the intervention and after the intervention. Intervention in the experimental group started with the therapeutic collaborative program since the week 24-28 in group and in the 5 sessions. Finally, the data were statistically analyzed. Results: The research population included 60 women with gestational diabetes with a mean age of 32.72 years. The subjects in the experimental and control groups were homogeneous in terms of demographic characteristics (P-value >0.05). There was no significant difference between two groups in terms of blood glucose before the intervention (P <0.05). Blood glucose decreased significantly in both groups (P-value <0.05). After intervention, blood glucose level in the experimental group was significantly lower than that of the control group (P-value <0.05). The total score of health promoting behaviors increased significantly after intervention in the experimental group (P-value <0.05). However, no significant difference was seen in the control group (P-value <0.05). Conclusion: Educational intervention based on the collaborative care method improved health promoting lifestyle in women with gestational diabetes. Lifestyle modification decreased blood glucose level in patients.

Keywords: Gestational diabetes, Blood glucose, Lifestyle, Collaborative care.

Introduction

Due to industrialization of countries in the 21st century, disease patterns have changed from acute disease to chronic one like diabetes mellitus. Diabetes is referred to as a silent epidemic which is one of the most important health and socioeconomic problems and accounts for 9% of total deaths in the world [1]. At the present time, there are more than 415 million diabetic people around the world and it is estimated to reach 642 million by 2040 [2]. The three main types of diabetes include type I diabetes (juvenile diabetes), type 2 diabetes and gestational diabetes. Gestational diabetes is one of the most common medical problems during the pregnancy. It is caused by carbohydrate intolerance in pregnant women.

Risk factors of gestational diabetes include: having the age of 30 years or more, family history of diabetes, high birth weight,

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stillbirth or neonatal mortality in previous pregnancies, non-white race, more than 4 deliveries, neonate or fetuses with previous abnormalities in pregnancy, Asian race, smoking, frequent abortions and a history of preterm infant births [3]. Based on the studies, gestational diabetes affects 1 to 14 percent of pregnancies. In Iran, its prevalence is different in several studies given the region, type of population and diagnostic criteria, so that highest prevalence (18.6%) of this disease was reported in Karaj and its lowest prevalence (7 %) was reported in Kermanshah. The prevalence of gestational diabetes in Hamadan has been reported to be 52.3% in 2015 [4, 5]. Gestational diabetes can cause complications during the pregnancy and high-risk childbirth and might leave adverse effects on the mother, fetus, and infant. Thus, preventing and controlling this disease is necessary in order to decrease its complications.

Chronic diseases, including diabetes, are caused as a result of unhealthy living conditions. Thus, attention has been paid to the origin of these diseases, including the lifestyle and behavior of humans [6]. Hence, health promotion behaviors are one of the best ways through which people can maintain and control their health [7]. Lifestyle modification is the core of women's health management programs and can provide conditions for improving the quality of physical and mental performance during the next years of life [8]. As patients are the most important members of the diabetes care team, successful management of this disease is largely dependent on the collaboration of patients in lifestyle modifications [9]. The lifestyle of diabetic mothers is a combination of six dimensions of stress management, responsibility for health, interpersonal communication, spiritual growth, nutrition and physical activity. Studies have indicated that healthy lifestyle education improves blood glucose indicators in diabetic patients [10].

The educational effect depends on the proper use of behavioral science theories [11]. One of the important and localized models for modifying the lifestyle of patients that has been used in Iranian nursing care in recent years is the collaborative care model [12]. The goal of this model is to create and establish an effective, balanced and continuous relationship between the team members and the patient, and to increase the collaboration, motivation and responsibility of the team members in the care and treatment processes. The main characteristic of this theory is the identification of individual`s attitudes, beliefs and values, which can be modified [13].

This model includes four stages of motivation, preparation, involvement and evaluation. In this model, the nature of the collaborative role of the patient or group members in the treatment process is a fact beyond the individual role and nature of each of them. According to this model, the quality and type of communication between the two parties are critical [14]. Collaborative care model has recently emerged as an inter-professional model among the complex health care needs. It involves decision making by the client and the nurse to meet the patient's needs. It contributes to the controlling of the symptoms and manifestations of the disease. In turn, it eventually leads to the adaptation to the disease and enhances patient collaboration in health care programs and increases patient autonomy in daily activities [14]. Given what was stated above, the objective of this study was to evaluate the effect of collaborative care on blood glucose and lifestyle in women with gestational diabetes in Hamadan.

Materials and Methods

This clinical trial study was conducted with pre-test and post-test design in pregnant women with gestational diabetes referring to health centers of Hamadan University of Medical Sciences in 2017-2018. The research inclusion criteria included 1- Definite diagnosis of gestational diabetes by a physician or midwife of the health center, 2- Pregnant woman have to be at the pregnancy week of 24-28, 3- The pregnant woman should be physically and mentally healthy and be able to communicate verbally with the researcher, 4- Not having any previous known physical or psychological disease so that learning be possible for her, 5-Having a willingness to participate in the study, 6- living in Hamadan, 7- And having reading and writing literacy. The research exclusion criteria included 1- Having a history of participation in training classes on gestational diabetes, 2- Absence at training sessions for more than one session, 3- Be restricted or prohibited to perform physical activity and exercise. In this study, convenient sampling method was used. The samples were randomly assigned into intervention and control groups, so that the subjects having even number were assigned into the intervention group and subjects having odd number were assigned to the control group. Assuming $P_0 = 0.5$ and the probability of its reduction to $P_1 = 0.1$ after training and considering $\alpha = 0.05$ and $\beta = 0.05$, the minimum number of samples required for each group was considered to be about 30 people using the formula 1.

Formula 1

$$n = \frac{2\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2 pq}{(p_0 - p_1)^2}$$

In the present study, a two-section questionnaire was used for collecting the data: a) a demographic information questionnaire, including items such as the age of the first pregnancy, the number of pregnancies, the number of deliveries, the age of the last child, the age of the recent gestational, height, weight, b) Health promotion life style questionnaire which included 52 questions in six dimensions, including spiritual growth and self-actualization (11 questions), health responsibility (13 questions), interpersonal relationships (9 questions), stress management (5 items), exercise and physical activity (7 items), and nutrition (7 items). It was scored from 1 to 4 (1 = never, 2 = sometimes, 3 = often, 4 = always) according to the Likert Scale. Based on the questionnaire scoring guideline, the total score of questions in each domain was divided by the number of questions in each domain. In addition, in order to calculate the total score, the sum up of scores of 52 items was divided by 52. Accordingly, the total score and the individual score of the domains were in the range of 1 to 4. The validity and reliability

of this instrument have been confirmed in previous studies [15]. The reliability of this instrument for the whole instrument was obtained 0.88 using Cronbach's alpha. It was also reported 0.64, 0.86, 0.75, 0.91, 0.79, and 0.81, respectively, for each of the domains of spiritual growth and self-actualization, responsibility for health, interpersonal relationships, stress management, exercise and physical activity, and nutrition . The researcher obtained the license from Research Deputy of Hamadan University of Medical Sciences and referred to the clinics having introduction letter at hand. The researchers obtained the consent of the authorities to cooperate in this study after providing explanation on the process and the research objectives.

After receiving written informed consent, the questionnaires were distributed among the subjects. The fasting blood glucose of the subjects was measured by the glucometer on the same day. In the next step, the samples were randomly divided into intervention and control groups based on their numbers. The intervention group received the collaborative care program since 24 to 28 gestational week as the group and for 5 sessions. Accordingly, three sessions of educational collaborative care were held in three consecutive weeks and two sessions of follow-up collaborative care were held two weeks after the educational collaborative care. The educational content was prepared by the researcher based on authoritative texts and the main sources. Then, in the collaborative session with the patients, the educational content was presented and collaborative care plan program was finalized by individual agreement with the samples. Based on the clinical symptoms, the experimental group samples were divided into three groups. Interventions were performed equally and with an average of 45 to 60 minutes in all three groups. At the end of each session, they were evaluated. It should be noted that a booklet was prepared, and education was provided to the subjects at the second session. For the control group, two discussion sessions were held on the importance of the medicine diet, food diet and exercise. The sessions were held every week and each session lasted 60 minutes. After the completion of the study, the educational booklet was given to the control group. After the completion of collaborative care programs, the questionnaires were re-distributed among the subjects of intervention and control groups. Then, the fasting blood glucose was re-measured using the glucometer on the same day. The data were analyzed using SPSS/22, software. In the descriptive statistics section, for quantitative data, indicators such as mean and standard deviation were used, and for qualitative data, indicators such as frequency and percentage were utilized. In the analytical statistics section, Chi-square test (or Fischer's exact test) was used to evaluate the relationship between qualitative variables. To examine the relationship between quantitative variables, t-test, independent t-test and covariance analysis were used. The Kolmogorov-Smirnov test was used to examine the distribution of data. The significance level was considered 0.05. It should be noted that the subjects were ensured that all their information would remain confidential to the research team. They were allowed to withdraw from the research at any stage. The questionnaires were also without name and code and the researcher was committed to publish the results of the research in general and for all individuals. This project was proposed in the Ethics Committee of Hamadan University of Medical Sciences and it was approved under the ethics code of IR.UMSHA.REC.1396.665. This study was also registered at the Iranian Center for Clinical Trials with number of IRCT20120215009014N203.

Results

The subjects of this study included 60 women with gestational diabetes with the mean age of 32.72 ±4.54 years and mean gestational age of 5.78 ± 0.61 months. The mean height of the subjects was 160.04 ± 5.4 cm and the mean weight of them was 26.73 ± 5.85 kg. Most women had associate and bachelor level of education (32.66%) and most of them were housewives (78.33%). Most of the studied women had diploma level of education (26.66%). Most of the subjects had moderate economic status (78.33%) and the moderate marital satisfaction (43.33%). Most of the women (76.66%) had no history of gestational diabetes. Most of them had more than one delivery (36.66%). Most of them had one child (41.66), and the age of their last child was below 5 years of old (68.33%). The number of pregnancy in most of the women was 2 (40%). The first gestational age of most of them was in the range of 21-30 years (53.33%). Most of the subjects were living in urban areas (86.66%). The control and experimental groups were homogeneous in terms of all studied variables (P-value <0.05). Based on Table 1, the mean of blood glucose in women with gestational diabetes was not significantly different (P <0.05). However, the blood glucose level of women with gestational diabetes after the intervention was significantly lower than that of the control group (P-value <0.001). The mean of blood glucose in the control and experimental groups was significantly decreased after the intervention (P-value <0.001).

Table 1- Comparing the blood glucose of women with gestational diabetes before and after intervention in experimental and control groups.

	Group	Before	After	P value*
Blood glucose level	Experimental	103.03±9.55	91.83±3.33	<0.001
	Control	100.53±4.15	97.71±3.96	<0.001
	P value**	0.194	<0.001	

*: The paired-sample t test; **: The independent-sample t test

Based on Table 2, there was a significant difference between the two groups before the intervention in terms of scores of women's health promoting behaviors, responsibility, physical activity, nutrition, self-actualization and stress management (P-value <0.05). The results of covariance analysis after adjusting the scores before intervention showed that the difference between the two groups was significant after the intervention (P-value <0.001). As shown in the Table 2, the mean scores were not significantly different before and after the intervention

in the control group (P-value <0.05). However, the mean scores in the experimental group increased significantly after the intervention (P-value <0.001).

Based on the Table 2, there was no significant difference between the two groups before the intervention in terms of the dimension of interpersonal relationship scores (P-value >0.05). The comparison of the two groups after the intervention showed a significant difference between the two groups (P-value <0.001). Table 2 also shows that the mean scores before and after the intervention in the control group were not statistically significant (P <0.05). However, the mean scores in the experimental group did not show a significant difference after the intervention (P-value <0.05).

Table 2- Comparison of the mean total scores (standard deviation) of health promoting behaviors before and after the intervention in the experimental and control groups.

Variable	Group	Before	After	P value*
Total of health promoting behaviors	Experimental	2.72±0.48	3.27±0.32	**<0.001**
	Control	2.24±0.45	2.31±0.45	**0.114**
	P value**	**<0.001**	**<0.001**	
Responsibility	Experimental	2.81±0.53	3.32±0.42	**<0.001**
	Control	2.26±0.53	2.31±0.51	**0.348**
	P value**	**<0.001**	**<0.001**	
Physical activity	Experimental	2.76±0.42	3.30±0.35	**<0.001**
	Control	2.33±0.45	2.40±0.44	**0.084**
	P value**	**<0.001**	**<0.001**	
Nutrition	Experimental	2.46±0.48	3.16 ±0.36	**<0.001**
	Control	2.17±0.43	2.26± 0.50	**0.058**
	P value**	**0.016**	**<0.001**	
Self-actualization	Experimental	2.74±0.45	3.39±0.30	**<0.001**
	Control	2.27±0.42	2.35±0.50	**0.157**
	P value**	**<0.001**	**<0.001**	
Interpersonal relationships	Experimental	2.86±1.82	3.16±0.34	**0.386**
	Control	2.19±0.52	2.24±0.46	**0.350**
	P value**	**0.058**	**<0.001**	
Stress management	Experimental	2.71±0.48	3.29±0.44	**<0.001**
	Control	2.28±0.52	2.34±0.52	**0.182**
	P value**	**0.002**	**<0.001**	

*: The paired-sample t test; **: The independent-sample t test

Discussion

In the present study, the effect of collaborative care on blood glucose and lifestyle in women with gestational diabetes was evaluated. Statistical comparison of demographic variables in the control and experimental groups showed that the two groups were homogeneous in terms of these variables. Homogeneity of two groups ensures that the differences observed in various dimensions of lifestyle in two groups were merely the result of education. The demographic results of this study were similar to those of other studies conducted in this regard. Among these studies, the studies conducted by Kaveh et al. [16], Mahmoudi et al [17], and can be referred. Among the foreign studies similar to demographic results of this study, the studies conducted by Saydam et al. [18], and Sonmezer et al. [19] can be highlighted. The results of this research showed that there was no significant difference between the experimental and control groups in terms of blood glucose level in women with gestational diabetes before and after the education. Although blood glucose level in both control and experimental groups was significantly lower after the intervention in contrast to before intervention, this reduction was higher in the experimental group than that in the control group. In addition, the blood glucose level in the experimental group after the intervention was significantly less than that of the control group. The significant reduction in blood glucose in the control group can be attributed to two discussion sessions about the importance of the medicine diet, food diet and exercise. However, another hypothesis suggested that some people in the control group may have been in contact with the patients in the clinic, and some information has been transmitted to them in the clinic, or control group subjects had personal studies. Significant reduction in blood glucose level in the experimental group, given homogeneity in the two groups, can be attributed to the effect of educational intervention based on collaborative care model. In a research conducted by Shamsi et al, the effect of healthy lifestyle education (exercise and walking) on blood glucose control in women with type 2 diabetes was examined. Hemoglobin A1C and the fasting blood glucose (FBS) levels were significantly reduced after 3 months of intervention in the experimental group [20].

These results were also consistent with those of the research conducted by Shakeri et al., who showed that exercise program was associated with a significant reduction in blood glucose and blood fat in diabetic patients [21]. Mohammad Hossein Kaveh et al., evaluated the effect of nutrition education and exercise on metabolic control indicators in patients with gestational diabetes. The results showed that blood glucose levels decreased one and two hours after eating food in both groups after the intervention, but the reduction in the experimental group was more than that of the control group and it was close to the level of glucose treatment [22]. These results were much closer to the results of the current study.

Although most of the educational interventions have led to the reduction in blood glucose levels in diabetic patients, the level of reduction in the blood glucose has been different in various studies. Different results in various studies can be attributed to differences in the research population, duration of education, the type of educations provided and the criteria to measure the blood glucose. In the most of the studies stated, the aspects of physical activity and lifestyle nutrition have been usually investigated, while in the current study, other aspects of lifestyle, including spiritual growth and self-actualization, responsibility on health, interpersonal relationships and stress management have also been investigated. However, it was agreed that blood glucose control was not effective without lifestyle modification. Yoo et al., introduced the factors of selecting an unhealthy lifestyle such as overweight, lack of proper physical activity, and stressful life as factors affecting the blood glucose control [23]. Phipps argued that people take

measures by selecting an appropriate lifestyle to maintain and improve his or her health and prevent disease, such as observing sleep habits and activity, exercise, weight control, lack of smoking and drinking alcohol [24]. Other results of this study showed that education based on collaborative care model increased the total score of health promotion behaviors, although the total score of health promotion behaviors before the intervention in the test group was significantly higher than that of the control group. However, by statistical adjustment of this effect, the result of the test showed that the total score of health promotion behaviors in the control group did not change significantly after the intervention.

However, in the experimental group, there was a significant increase, thus the total score of the health promotion behaviors after the intervention in the experimental group was significantly more than that of the control group. With regard to the dimensions of responsibility, physical activity, nutrition, self-actualization and stress management, the difference in the scores of experimental and control groups as well as the pattern of changes in scores after the education, was similar to the total score of health promotion behaviors. With regard to the dimension of the interpersonal relationships of health promotion behaviors, no significant difference was found between the two control and experimental groups before the intervention. Although the intervention did not lead to a significant increase in the scores of interpersonal relationships in any of the control and experimental groups, it was significantly higher in the experimental group than that in the control group after the intervention.

In general, it should be stated that intervention based on the collaborative care method has led to health promotion behaviors in general and in all its dimensions. Mohaddesi et al., showed that counseling improved the lifestyle of mothers with gestational diabetes and reduced the complications related to mothers with gestational diabetes [5]. Studies conducted by Yoo et al., [23], Knowler et al., [25], Korpi et al., [26], Mamaneh et al., [27], also showed that educational interventions had a positive effect on the lifestyle promotion in patients with diabetes. However, in some studies, including the study conducted by Mendelson et al., [28], there was no statistically significant difference between the intervention and control groups in the mean scores of health promoting lifestyle. With regard to the positive and significant effect of collaborative care educational model in diabetic patients, Ismaelzadeh et al., (2000) evaluated the effect of educational intervention based on the collaborative care model on self-monitoring of blood glucose in type 2 diabetic patients [29]. Moreover, Sajjadi et al., evaluated the effect of intervention based on collaborative care model on improving the self-concept of people with type 2 diabetes [30]. Both of the mentioned studies showed the effectiveness of collaborative care model on the performance of diabetic patients.

With regard to the effect of collaborative care model on the lifestyle and quality of life, Daneshi et al., evaluated the effect of collaborative care model on the quality of life of adults with asthma [31]. Moreover, Nayeri et al., evaluated the effect of collaborative care model on the quality of sleep of patients with heart failure [27]. Stewart et al., evaluated the effect of collaborative care on reducing the risk of cardiovascular events. Chahkhuei et al., examined the effect of collaborative care on the lifestyle of patients with multiple sclerosis (MS) [32]. All of these studies education, based on the collaborative care model, had a significant effect. As the level of blood glucose in the experimental group had significantly decreased after the intervention in the current study and this decrease was more in the experimental group than that in the control group. Given the improvement of the scores of dimensions and the total score of health promotion behaviors, it can be concluded that the decrease in blood glucose was due to the improvement of health promotion behaviors in the experimental group, meaning that collaborative care model improved health promotion behaviors and lifestyle. Also, lifestyle improvement decreased the level of blood glucose in women with diabetes. In their study on the relationship between lifestyle components and the incidence of type II diabetes, Masoudnia et al., showed that there was a significant difference between type 2 diabetes subjects and healthy subjects in terms of majority of the lifestyle-related components, including spiritual growth and self-actualization, stress management, and responsibility on health and physical activity [33]. Moreover, with regard to the relationship between diabetes and the different dimensions of health promoting behaviors and lifestyle, the studies conducted by Hasanvand et al [34] could be referred. With regard to the relationship between spiritual growth and blood glucose control in diabetic patients, it can be stated that having a sense of peace of mind, having hope for future, having a purposeful life and trying to achieve the goals, can empower people. In other words, healthy people with an emphasis on positive points empower themselves in different areas of life, leading to increased resistance in critical conditions [33]. With regard to the relationship between responsibility on health and blood glucose control in diabetic patients, it can be stated that some conditions, such as high cost of referring to physician, tests and high costs related to care and following the medical orders, reduce the patient's responsibility [33].

With regard to the relationship between interpersonal relationships and blood glucose control in diabetic patients, it can be stated that proper interpersonal relationships were crucial in creating mental health, personality development, identification, increasing job productivity, increasing life quality, increasing adaptability and self-actualization. People who were poor in establishing communication with others, were less likely to be accepted by people in the community thus faced many problems [33]. With regard to the relationship between stress management and blood glucose control in diabetic patients, it can be stated that diabetes was a source of stress and concern for the patient and his family. The adaptive coping with stress was difficult for diabetic people, since it affected all aspects of personal life, including nutrition, exercise, job, recreation and family life. Moreover, the stress management methods such as yoga and self-relaxation have been less accepted by patients. Another hypothesis was that

stress itself was a risk factor for diabetes, and a diabetic person might be an anxious person who is not successful in controlling his stress. Thus, both hypotheses can be considered in this regard.

With regard to the relationship between exercise and physical activity and blood glucose control in diabetic patients, it can be stated that low physical activity was one of the major risk factors for type 2 diabetes [35]. Studies have indicated that long-term watching TV had a positive relationship with type 2 diabetes risk. In addition, moderate to high physical activity was associated with reduced risk of type 2 diabetes [36]. In addition, planned sports activities reduced the severity of type 2 diabetes complications and reduced the treatment costs [34]. With regard to the relationship between nutrition and blood glucose control in diabetic patients, it can be stated that the diet had a direct relationship with type 2 diabetes, and the type of diet was different in diabetic people and healthy people. This study was the first study conducted to evaluate the effect of collaborative care on blood glucose and lifestyle in women with gestational diabetes. However, it suffered some limitations which should be considered in generalizing the results. One limitation of this study was the measurement instrument. The lifestyle components were measured using self-assessment method, so this instrument might lead to misunderstanding of the items of the questionnaires and it might affect the external validity of the test. Another limitation of this study was that as majority of the respondents belonged to Fars and Turkish ethnic groups, measurement instrument might be influenced by culture and language. Hence, it is recommended to researchers to use more direct methods that are less sensitive to measurement instrument misunderstanding, in addition to using indirect measurement or self-assessment methods. Moreover, in order to generalize the results more accurately, it is recommended that patients be selected among multiple ethnic groups in Iran, including Lar, Kurdish, Azeri, Arab, Baluch and Fars. It is also recommended that the studies could be conducted to compare this educational model with other educational interventional approaches.

Conclusion

The results of the present study showed that education based on collaborative care model had a significant effect in promoting the lifestyle of the mothers with gestational diabetes mellitus. The total score of health promotion behaviors and the scores of all dimensions of health promotion behaviors showed an increase in diabetic mothers. In addition, it was observed that educational intervention based on collaborative care model decreased blood glucose levels in mothers with gestational diabetes. It can be concluded that the educational intervention improved lifestyle and healthy lifestyle decreased the blood glucose levels in mothers with gestational diabetes.

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References

1. Ahmadi A, Hasanzadeh J, Rajaefard AJIJoE, Metabolism. Metabolic control and care assessment in patients with type 2 diabetes in Chaharmahal & Bakhtiyari Province 2008. 2009;11(1).
2. care ADAJD. Report of the expert committee on the diagnosis and classification of diabetes mellitus. 1997;20:1183-97.
3. Jenum AK, Mørkrid K, Sletner L, Vange S, Torper JL, Nakstad B, et al. Impact of ethnicity on gestational diabetes identified with the WHO and the modified International Association of Diabetes and Pregnancy Study Groups criteria: a population-based cohort study. 2012;166(2):317-24.
4. Khooshehchin TE, Keshavarz Z, Afrakhteh M, Shakibazadeh E, Faghihzadeh SJEp. Perceived needs in women with gestational diabetes: a qualitative study. 2016;8(12):3412.
5. Jafari-Shobeiri M, Ghojazadeh M, Azami-Aghdash S, Naghavi-Behzad M, Piri R, Pourali-Akbar Y, et al. Prevalence and risk factors of gestational diabetes in Iran: a systematic review and meta-analysis. 2015;44(8):1036.
6. Shobeiri F, Masoumi SZ, Nikravesh A ,Heidari Moghadam R, Karami M. The impact of aerobic exercise on quality of life in women with breast cancer: A randomized controlled trial. Journal of Research in Health Sciences. 2016;16(3):127-32.
7. Motlagh Z, Mazloomy-Mahmoodabad S, Momayyezi MJZJoRiMS. Study of Health-promotion behaviors among university of medical science students. 2011;13(4):29-34.
8. Khodaveisi MP, Omidi AM, Farokhi SM, Soltanian ARP. The Effect of Pender's Health Promotion Model in Improving the Nutritional Behavior of Overweight and Obese Women. International journal of community based nursing and midwifery. 2017;5(2):165-74.
9. Moayed MS, Ebadi A, Khodaveisi M, Toosi MN, Soltanian AR, Khatiban M. Factors influencing health self-management in adherence to care and treatment among the recipients of liver transplantation. Patient Preference and Adherence. 2018;12:2425-36.

10. Sahyoun NR, Pratt CA, Anderson AJJotADA. Evaluation of nutrition education interventions for older adults: a proposed framework. 2004;104(1):58-69.
11. Khodaveisi M, Khah MS, Bashirian S, Karami M, Khodaveisi M. The effect of health belief model-based training on preventive behaviors of hepatitis B in addicts. International Journal of High Risk Behaviors and Addiction. 2018;7(2).
12. Bigdeli MA, Hashemi Nazari SS, Khodakarim S, Brodati H. Factors Affecting Self-Care in Patients with Type II Diabetes Using Path Analysis %J Iranian Journal Of Health Sciences. 2016;4(3):10-21.
13. Hazavehei SMM, Emdadi S, Khezeli M. Models and Theories of Health Education and Health Promotion in Physical Activity Interventions for Women: a Systematic Review %J Journal of Education and Community Health. 2014;1(2):67-84.
14. Bashirian S, Fathi Y, Barati M. Comparison of Efficacy and Threat Perception Processes in Predicting Smoking among University Students Based on Extended Parallel Process Model %J Avicenna Journal of Clinical Medicine. 2014;21(1):58-65.
15. Mohammadi Zeidi I, Pakpour Hajiagha A, Mohammadi Zeidi B. Reliability and Validity of Persian Version of the Health-Promoting Lifestyle Profile %J Journal of Mazandaran University of Medical Sciences. 2012;21(1):102-13.
16. Kaveh MH, Kiani A, Salehi M, Amouei S. Impact of Education on Nutrition and Exercise on the Level of Knowledge and Metabolic Control Indicators (FBS & PPBS) of Gestational Diabetes Mellitus (GDM) Patients %J Iranian Journal of Endocrinology and Metabolism. 2012;13(5):441-8.
17. Mahmoodi H, Asghari-Jafarabadi M, Babazadeh T, Mohammadi Y, Shirzadi S, Sharifi-Saqezi P, et al. Health Promoting Behaviors in Pregnant Women Admitted to the Prenatal Care Unit of Imam Khomeini Hospital of Saqqez. Journal of Education and Community Health. 2015;1(4):58-65.
18. Wilkinson SA, McIntyre HD. Evaluation of the'healthy start to pregnancy'early antenatal health promotion workshop: a randomized controlled trial. BMC pregnancy and childbirth. 2012;12(1):131.
19. Sonmezer H, Cetinkaya F, Nacar M. Healthy life-style promoting behaviour in Turkish women aged 18-64. Asian Pac J Cancer Prev. 2012;13(4):1241-5.
20. shamsi M, sharifirad G, kachoyee A, hassanzadeh A. The Effect of Educational Program Walking Based on Health Belief Model on Control Suger in Woman by Type 2 Diabetics. Iranian Journal of Endocrinology and Metabolism. 2010;11(5):490-9.
21. Shakeri M, Ahmadi R. The effect of exercise program on control sugar and blood fat in diabetics. Zanjan Univ Med Sci J. 2001;3:16-22.
22. Kaveh MH, Kiani A, Salehi M, Amouei S. Impact of Education on Nutrition and Exercise on the Level of Knowledge and Metabolic Control Indicators (FBS & PPBS) of Gestational Diabetes Mellitus (GDM) Patients. Iranian Journal of Endocrinology and Metabolism. 2012;13(5):441-8.
23. Yoo J-S, Lee S-J, Lee H-C, Kim M-J. The effect of a comprehensive lifestyle modification program on glycemic control and body composition in patients with type 2 diabetes. Asian nursing research. 2007;1(2):106-15.
24. Phipps WJ, Long BC, Woods NF. Medical-surgical Nursing: Concepts and Clinical Practice: with 731 Illustrations: Mosby; 1979.
25. Group DPPR. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. The Lancet. 2009;374(9702):1677-86.
26. Korpi-Hyövälti E, Schwab U, Laaksonen DE, Linjama H, Heinonen S, Niskanen L. Effect of intensive counselling on the quality of dietary fats in pregnant women at high risk of gestational diabetes mellitus. British Journal of Nutrition. 2012;108(5):910-7.
27. H ZS, SAH P, A Z, F AS. The Effect of the Collaborative Care Model Implementation on Quality of Life in Patients with Heart Diseases. Military Caring Sciences. 2017;4(1):39-48.
28. Mendelson SG, McNeese-Smith D, Koniak-Griffin D, Nyamathi A, Lu MC. A community-based parish nurse intervention program for Mexican American women with gestational diabetes. Journal of obstetric, gynecologic, and neonatal nursing : JOGNN. 2008;37(4):415-25.
29. Esmaeilzade J, Mohammadpour A, Sajjadi M. The effect of educational intervention based on continuous care model on self-monitoring of blood glucose in type 2 diabetics. Journal of Birjand University of Medical Sciences. 2016;23(4):277-85.
30. Sajjadi M, Tavakolizadeh J, Heidary Marghzar M. Effect of the Intervention based on Partnership Care Model on Self-Concept Promotion in Patients with Type II Diabetes. Quarterly of Horizon of Medical Sciences. 2017;23(1):41-7.
31. Daneshi F, Sabzevari S, Pooraboli B, ShojaeiShahrokhababdi M. The Effect of Partnership Care Model on the Quality of Life of Adults with Asthma. Iran Journal of Nursing. 2014;27(88):1-10.
32. Ghanbari S, Shayanpour R. Perspective and Experiences of Iranian People With Multiple Sclerosis Regarding Leisure: A Qualitative Study. Jundishapur J Chronic Dis Care. 2015;4(4):e29776.

33. Rahimi Moshkeleh S, Masoudnia E, Nik Seresht V. The Relationship between Components of Lifestyle And Incidence of Type 2 Diabetes among People Aged 30 to 60 Years in Rasht. Iranian Journal of Diabetes and Lipid Disorders. 2018;17(2):87-96.
34. Hasanvand B, Karami K, Khodadi A, Valipour M. Impact determination of strength and resistance training on Glycoside hemoglobin and blood sugar on patients with type II diabetes". scientific magazine yafte. 2011;13(3):75-81.
35. Fretts AM, Howard BV, Kriska AM, Smith NL, Lumley T, Lee ET, et al. Physical activity and incident diabetes in American Indians: the Strong Heart Study. American journal of epidemiology. 2009;170(5):632-9.
36. Hu FB, Li TY, Colditz GA, Willett WC, Manson JE. Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. Jama. 2003;289(1.1785-91:(4.