

Evaluation of the effects of diabetes self-management education based on 5A model on the quality of life and blood glucose of women with gestational diabetes mellitus: an experimental study in eastern Iran

SOMAYEH ROKNI¹, ZAHED REZAEI², ALI DELSHAD NOGHABI³, MOOSA SAJJADI⁴, ALI MOHAMMADPOUR⁵

¹ Department of Medical Surgical Nursing, School of Nursing, Gonabad University of Medical Science, Gonabad, Iran;

² Social Determinants of Health Research Center, Gonabad University of Medical Science, Gonabad, Iran;

³ Social Development and Health Promotion Research Center, Gonabad University of Medical Sciences, Gonabad, Iran;

⁴ Department of Medical Surgical Nursing, School of Nursing, Nursing Research Center, Gonabad University of Medical Sciences, Gonabad, Iran; ⁵ Department of Medical Surgical Nursing, School of Nursing, Social Determinants of Health Research Center, Gonabad University of Medical Science, Gonabad, Iran

Keywords

Self-management • 5A model • Quality of life • Blood glucose • Gestational diabetes • Iran

Summary

Introduction. Gestational diabetes mellitus (GDM) is an important condition during pregnancy. The aim of the current study was to evaluate the effects of self-management education based on 5A model on the quality of life and blood glucose level of women with GDM.

Methods. This quasi-experimental study was conducted on 54 pregnant women referred to the urban health care centers affiliated to the Gonabad University of Medical Sciences from March 2019 to March 2020 based on purposive sampling method. Participants were randomly allocated into intervention and control groups based on stratified random sampling using permuted block randomization method. The intervention group received self-management education program based on 5A model in five sessions during two months. Demographic data, blood glucose level, and

diabetes quality of life (DQOL) questionnaire were collected for each participant. Data analysis was performed using the SPSS software version 16 and the level of statistical significance was set at 0.05.

Results. Mean age of the participants was 33.11 ± 5.35 years old. At the end of the intervention, the mean blood glucose level of the participants in the intervention group was significantly lower compared to the control group ($p < 0.001$). The quality of life in the intervention group was significantly improved at the end of the intervention compared to the control group ($p < 0.001$).

Conclusions. Self-management education based on 5A model can effectively improve quality of life and blood glucose levels in women with GDM.

Introduction

Gestational diabetes mellitus (GDM) is the most common metabolic disorder in pregnancy and is considered as the most common pregnancy complication [1]. GDM usually occurs in the second half of the pregnancy, when the body of pregnant mother is not capable of secreting enough insulin to compensate increased blood glucose due to increased nutritional intake of carbohydrates [2]. Globally, GDM affects up to 15% of pregnant women worldwide, and accounts for 90% of all cases of diabetes in pregnancy [3, 4]. In Asia, the prevalence of GDM was reported to be 11.5% [5]. The prevalence of GDM in Iran was reported to be 5.88% [6].

Various changes and complications that occur in pregnancy affect physical, psychological, and social aspects of a pregnant woman's life. Overall, these changes affect the quality of life in pregnancy at different gestational ages [7]. Many of these complications are preventable by performing prenatal care and active participation of pregnant women in their health care

process [8]. There is no definite cure for GDM and the most effective management method for GDM is through internalizing self-management behaviors in pregnant women as more than 95% of the patient care in GDM is performed by the pregnant women themselves [9, 10]. Therefore, considering the increasing trend of GDM and its economic burden, it is necessary to treat and manage GDM effectively. However, the currently available education to improve quality of life and blood glucose management in GDM that are provided in health care centers in Iran are limited and passive. Furthermore, the level of understanding and implementation of the provided education in personal life of pregnant women are not evaluated in health care centers.

One of the methods of GDM management by the individual is through the implementation of self-management programs [11]. One of the recommended self-management programs in GDM is based on the 5A model. Self-management program based on 5A model is an evidence-based approach and is used to change health behaviors and improve individual's health status. The 5A model is composed of five stages, including

Awareness, Appeal, Ask, Act and Advocacy [12]. Simplicity and briefness are the unique characteristics of self-management programs based on 5A model that makes them distinguishable from other self-management models [13]. The main goal of self-management program is improving the quality of life through reaching the maximum independence, self-management, and reliance on ones abilities in performing self-management [14]. Few studies have evaluated the effects of self-management programs based on 5A model. To the best of our knowledge, the effects of self-management interventions based on 5A model have not yet been evaluated in pregnant women with GDM. As improving the quality of life requires active patient cooperation, self-management programs are of great importance in the management of GDM. Therefore, the current study was conducted to evaluate the effects of diabetes self-management education on the quality of life and blood glucose levels of pregnant women with GDM.

Materials and method

The current study was an experimental study with two groups (intervention and control groups). Study participants were selected from pregnant women with the diagnosis of GDM who referred to Gonabad city Health Care Centers from March 2019 to March 2020. The study was approved by the Ethical Committee of the Gonabad University of Medical Sciences (IR.GMU.REC.1398.103). A written informed consent was obtained from all participants before entering the study. Participants were ensured about the confidentiality in data collection and analysis.

Sample size was determined based on mean difference equation and considering 80% power and 95% confidence interval. The mean difference for quality of life and blood glucose were determined based on previous study

The inclusion criteria were willingness to participate in the study, ability to read and write, fasting blood glucose greater or equal to 93 g/dl, no history for systemic, neurologic or psychological diseases; no history for drug abuse, smoking, or alcohol consumption; not being diagnosed as high-risk pregnancy, and documented diagnosis of GDM by an endocrinologist. Exclusion criteria were failing to participate in the intervention sessions for more than two sessions, complicated pregnancy (either maternal or fetal complications), and exposure to stressful conditions during the study duration, including serious illness in spouse, or children; death of close relatives, accidents, or labor. Participants were selected based on inclusion and exclusion criteria using purposive sampling method. Participants were then instructed about the aims and procedures of the study and pregnant women who were willing to participate in the study by giving a written informed consent were randomly assigned to intervention (n = 27) and control (n = 27) groups based on stratified sampling using permuted blocks.

RESEARCH INSTRUMENTS

This study used a two-part questionnaire that comprised of 1) demographic data, including age, gender, gestational age, gravida, number of children, height, weight, place of living, education, job, insurance status, economic level, spousal characteristics, and 2) the diabetes quality of life questionnaire (DQOL). DQOL is a 15-item questionnaire that evaluates the quality of life of patients with type 1 and 2 diabetes. DQOL items are scored using a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). The minimum and maximum score of the questionnaire are 15 and 75 with higher scores indicating better quality of life. Quality of life is then categorized into three groups; acceptable (achieving 75% of the maximum score), somehow acceptable (achieving 50% to 75% of maximum score), and poor (achieving less than 50% of the maximum score) quality of life. Reliability and validity of the DQOL was previously approved on a sample of Iranian population [16]. Furthermore, blood glucose level of the participants was recorded in a researcher made checklist.

Intervention

The intervention group received self-management educations based on 5A model. The intervention duration was two months. Based on the findings of a pilot session, three sessions were planned to conduct the intervention. Education sessions were designed to last for 1.5 hours based on the five following steps:

- 1. Evaluation:** This step included data collection from medical records of the participants as well as in person interviews (filling the study questionnaire and recording blood glucose levels). This step was conducted to evaluate participants in terms of risk factors, medical history, medication history, and sleep status, as well as type of diet, physical activity and stress level.
- 2. Guidance:** This step included informing the participants about their condition based on the collected data from the previous step. Individual health threats, including unhealthy eating, inappropriate eating times, low or inadequate physical activity level, and lack of stress management strategies in pregnancy. In this step the benefits of behavior change were highlighted for the participants.
- 3. Agreement:** This step included an agreement between the participants and researchers on choosing the right behavioral goals based on the condition of each participant and to design a functional plan to reach these goals. Each goal was given a scale ranging from 0 to 10 and participants were asked to rate their behavior every day during the first month and record the scores in their behavior goal logbook. Steps 2 and 3 were held for each participant separately in the first session (1.5 hours in total).
- 4. Aid:** this step was held either in the form of group session or individual session based on the number of

participants who required the specific intervention. Education materials that were provided in this step emphasized on healthy eating, adequate physical activity, and suitable time for physical activity, stress, and blood glucose management. The education material was also provided to the participants in the form of pamphlets. This step was conducted in the second intervention session.

- 5. Follow up:** This step included following up the practice of participants for two months. In order to ensure proper action by the participants, phone calls were conducted daily in the first two weeks, twice weekly in the next two weeks and weekly afterwards till the end of the follow up duration. During the phone calls, participants were reminded to follow their planned behavior instructions. Furthermore, participant progress was evaluated every four weeks through phone call or in-person interview (third session). In the interview sessions the agreed operational plan and behavior goals were reviewed and the level of progress toward these goals were evaluated. Goals or operational plans were changed in order to fit the condition of the participants.

The control group received routine education based on the Ministry of Health recommendations. The education focused on healthy eating and adequate physical activity. At the end of the intervention duration all the study questionnaires and checklists, including the DQOL, and blood glucose level were filled for all participants in both the intervention and control groups. All the documents and modules were given to the control group at the end of the study for ethical considerations.

STATISTICAL ANALYSIS

Normality of the continuous variables was evaluated using the Kolmogorov-Smirnov test. Comparison of the qualitative variables between groups at baseline was performed using the chi-square test. The independent t-test or Mann-Whitney test were used to compare continuous variables between groups at baselines and follow up based on normality of the data. The paired-t-test or Wilcoxon test were used to compare continuous variables between

baseline and follow up based on normality of the data. Data analysis was performed using the statistical package for social sciences (SPSS) software version 16. Level of statistical significance was considered as $p < 0.05$.

Results

The mean age of the participants was 33.11 ± 5.35 years old. Demographic characteristics of the participants are shown in Table I. There was no significant difference between the intervention and control groups in terms of demographic data except for gestational age and education level.

The Mann-Whitney test indicated no significant difference in terms of DQOL total score between the intervention and control groups at baseline (37.62 ± 10.89 and 37.29 ± 4.05 , respectively, $p = 0.23$). Based on the DQOL total scores participants in both groups were categorized as “somehow acceptable” to “poor”.

Changes in DQOL and its domains in study groups are shown in Table II. The total and domain scores of the DQOL questionnaire significantly increased at the end of the study compared to the baseline values in the intervention group ($p < 0.001$) and reached from “somehow acceptable” to “acceptable” level ($p < 0.001$). The DQOL total score was significantly lower in the control group at the end of the study (36.62 ± 5.49) compared to the baseline values (48.29 ± 6.49 , $p = 0.02$) (Tab. II).

Blood glucose level significantly reduced at the end of the study compared to the baseline values in the intervention group ($p < 0.001$), while blood glucose level was not significantly different at the end of the study compared to the baseline values in the control group ($p = 0.54$). Blood glucose level was significantly higher in the control group compared to the intervention group at the end of the study ($p < 0.001$) (Tab. III).

Discussion

The results of the present study showed that self-management education based on 5A model improved

Tab. I. Comparison of demographic variables between study groups at baseline.

Variable		Intervention N (%)	Control N (%)	p-value
Education level	Primary	3 (11.1)	6 (22.2)	0.02* [†]
	Secondary and above	24 (88.9)	21 (77.8)	
		Mean \pm SD	Mean \pm SD	p-value
Age (years)		33.55 \pm 5.23	32.66 \pm 5.23	0.64 [‡]
Gestational age (week)		28.40 \pm 3.28	30.22 \pm 3.20	0.03* [†]
Age of marriage (years)		23.25 \pm 4.24	22.66 \pm 4.93	0.63 [‡]
Gravida		2.44 \pm 1.01	2.40 \pm 0.97	0.84 [‡]
Pre-conception weight (kg)		72.14 \pm 10.81	67.51 \pm 9.18	0.09 [‡]
Height (cm)		162.40 \pm 3.99	159.59 \pm 16.02	0.66 [‡]
Weight (kg)		80.74 \pm 10.23	77.44 \pm 8.15	0.19 [‡]
BMI (kg/m ²)		27.48 \pm 4.88	28.18 \pm 14.11	0.38 [‡]

SD: Standard Deviation. [†]The chi-square test was used for the comparison. [‡]The Mann-Whitney test was used for the comparison. [‡]The independent t-test was used for the comparison. * Significant difference

Tab. II. Comparison of DQOL total and domain scores between baseline and end of study among study groups.

DQOL	Group	Baseline	End of study	p
		Mean ± SD	Mean ± SD	
Satisfaction	Intervention	16.40 ± 4.65	22.51 ± 2.19	< 0.001**†
	Control	15.96 ± 1.50	15.11 ± 2.69	
	p	0.23 [‡]	0.86 [‡]	
Self-management	Intervention	16.33 ± 4.73	22.85 ± 1.48	< 0.001**†
	Control	16.14 ± 2.38	15.55 ± 2.60	
	p	0.85 [‡]	< 0.001 [‡]	
Total score	Intervention	37.62 ± 10.89	48.29 ± 6.49	< 0.001**†
	Control	37.29 ± 4.05	36.62 ± 5.49	
	p	0.89 [‡]	< 0.001**†	

SD: Standard Deviation.

† The Wilcoxon test was used for the comparison. ‡ The Mann-Whitney test was used for the comparison. [‡]The independent t-test was used for the comparison. * Significant difference**Tab. III.** Comparison of blood glucose levels between baseline and end of study among study groups.

Blood glucose	Intervention	Control	p
	Mean ± SD	Mean ± SD	
Baseline	101.96 ± 6.62	103.37 ± 12.08	0.86 [‡]
End of study	88.14 ± 6.28	104.11 ± 16.01	< 0.001**†
p	< 0.001**†	0.54 [‡]	

SD: Standard Deviation. † The Wilcoxon test was used for the comparison. ‡ The Mann-Whitney test was used for the comparison. * Significant difference

the quality of life in pregnant women with GDM. Similar to the findings of the present study, regardless of the differences in the study population, Soleimani et al. reported the quality of life of diabetic patients was somehow acceptable [17]. In addition to the maternal complications caused by diabetes, the fetuses of pregnant women with GDM are also at risk of developing dangerous complications, which can affect the quality of life of pregnant women with GDM. In a study aimed at investigating the effect of spiritual education on reducing anxiety and improving the quality of life of pregnant women with GDM, Beigi et al. stated that spiritual education could reduce anxiety and improve quality of life in pregnant women with GDM [18].

Azari et al. also reported that group spiritual therapy was effective in reducing anxiety and could improve the quality of life of pregnant women with GDM [19]. Spiritual teachings reduce anxiety in mothers and increase their satisfaction. Furthermore, reducing anxiety in pregnant women can reduce their worries and helps them perform self-management activities with peace of mind. In general, it can be said that these findings were consistent with the findings of the present study.

In another study by Makki et al. the effect of problem-solving skills training on the quality of life of pregnant women with GDM was evaluated. The study indicated that all domains of the quality of life gradually improved during the training period [20]. These findings were in line with the findings of the present study. Ghiasvandian et al. reported that self-management education was effective in improving the quality of life of patients with type 2 diabetic [21]. Saeedpour et al. investigated the effect of self-management education on the quality of life of diabetic patients and reported that quality of life of diabetic patients was poor. They found self-management

education effective in improving the quality of life of diabetic patients. The self-management education intervention was implemented using group discussion, face-to-face training, pamphlets, educational videos and tracts related to each of diabetes complications in three sessions over a period of three weeks [22]. Although these two studies deferred from the present study in terms of education method, educational content, time of presenting the education, and target population, their results were similar to the findings of the present study and all the three studies indicated that self-management promotion improved the quality of life in diabetic patients. Other studies used different methodologies to study the effect of educational interventions. Sharifi Rad et al. [23], Rezaei et al. [24], Baghianimoghadam et al. [25], Aghmolaei et al. [26], Wattana et al. [27] and Dunn et al. [28] pointed out that education intervention was effective in improving performance and quality of life in diabetic patients. These findings were consistent with the findings of the present study. Javanvash et al. used 5A model to conduct education intervention to elderly with acute coronary syndrome and showed that this education intervention had no effect on the quality of life of these elderly [29]. This finding was not consistent with the findings of the present study. The reason for this difference might be due to the difference in the sample size of the studies. Despite disease related complications, the elderly also face many age-related problems and disability that can have a great impact on their quality of life.

Another finding of the present study was the positive effect of self-management education based on 5A model on blood glucose level of pregnant women with GDM. Similarly, Moattari et al. used 5A model to conduct self-management education in patients with insulin-dependent diabetes and reported that this intervention

could reduce blood glucose and glycosylated hemoglobin in these patients

Improving self-management skills of pregnant women with GDM improves their skills and can help improve symptoms and psychological problems caused by anxiety and pregnancy. Furthermore, due to its simplicity and ease of use and the cultural and social appropriateness of its educational concepts, 5A model-based education can increase the motivation of pregnant women with GDM to deal with their disease.

One of the limitations of this study was the heterogeneity of the participants in terms of spiritual, psychological, and cultural characteristics; as well as the level of knowledge of the participants. This heterogeneity may have affected the results and could not be controlled by the researcher. Another limitation of this study was excluding illiterate pregnant women, which makes it impossible to generalize the results to this group of patients. Therefore, it is suggested that 5A model be taught to the staff of health care centers and the effect of this education be evaluated on illiterate patients. It is also recommended to implement 5A model for self-management education in other chronic diseases and to evaluate long term effectiveness of education programs based on 5A model in future studies.

Conclusions

The findings of the present study showed that self-management education based on 5A model was effective in improving the quality of life and blood glucose control of pregnant women with GDM. As maintaining the health of pregnant women and preventing the fetal complications of GDM are important goals of care during pregnancy, the findings of the present study could be of great value in nursing. Due to the fact that pregnant women are not always reachable to the health care staff to receive the necessary care, the best way to maintain their health is through self-management promotion. The 5A model can be effective in achieving this goal. Therefore, while emphasizing on the need for additional studies and considering the consistent results of many similar studies, education based on 5A model can be considered as a simple, practical, and effective alternative to somehow less effective traditional methods. Some clinical implications of this study are discussed as follows: Nurses' and families' awareness of the importance of providing self-management based on the 5A model on the quality of life and blood glucose levels in women with GDM can have good results in improving nursing services. It can also take a practical step in improving patients' status and dependence on the medical staff, enabling them to manage their problems. Some clinical implications of this study are discussed as follows: Nurses' and families' awareness of the importance of providing self-management based on the 5A model on the quality of life and blood glucose levels in women with GDM can help to improve nursing services. It can also take a practical step in improving patients' status and it is depending on the healthcare workers and enabling them to manage their problems.

Overall, the findings of the present study showed that self-management education, including the concepts of blood glucose management, diabetes complications, exercise and nutrition, lifestyle modification, stress management, medication, and foot hygiene through pamphlet, slide and movie presentation, lectures, group discussions, and workshops based on 5A model (evaluation, guidance, agreement, aid, and follow up) effectively improved the quality of life and reduced blood glucose levels in pregnant women with GDM. Considering the point that pregnant women are not always accessible by the health care staff to receive their health care services, the best approach for maintaining their health is through improving their self-management skills. One of the methods to achieve this goal is through educating mothers based on the 5A model.

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Conflict of interest statement

The authors declare no conflict of interest

Authors' contributions

S.R.: conception and design, data collection, writing and revision of the manuscript; A.N.D. and M.S.: concept and study design, critical revision and editing; Z.R.: participated in the study design, critical revision and editing of the manuscript; A.M.: supervisor, concept and study design, critical revision and editing. All authors reviewed and approved this manuscript.

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Correspondence: Ali Mohammadpour, Department of Medical Surgical Nursing, School of Nursing, Social Determinants of Health Research Center, Gonabad University of Medical Science, Gonabad, Iran. Tel.: +989151779436 - E-mail: amohammadpur@yahoo.com

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