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Does maternal and fetal health locus of control predict self-care behaviors among women with gestational diabetes?

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Abstract:

INTRODUCTION: Gestational diabetes is the most common metabolic disorder in pregnancy, and lack of self-care is the most important reason for mortality in diabetic patients. Since the glycemic control is associated with physiological and psychological mechanisms, variables such as health locus of control can play a role in health behaviors of diabetic patients. Therefore, this study was aimed to predict self-care behaviors among women with gestational diabetes based on maternal health locus of control (MHLC) and fetal health locus of control (FHLC).

METHODS: This study is a descriptive, predictive correlational study that it is conducted on over 400 women with gestational diabetes attending the health centers and clinic of hospitals affiliated to Mashhad University of Medical Sciences in 2015. Data were collected using individual questionnaire, self-care derived from the summary of diabetes self-care activities, MHLC, and FHLC scale. The data were analyzed using Spearman's correlation coefficient test, linear regressions model, and multiple regression in SPSS software version 16. $P < 0.05$ was considered statistically significant.

RESULTS: Results of Spearman's correlation coefficient test showed a significant direct linear relationship between self-care and internal MHLC ($P = 0.027$) and internal dimensions ($P < 0.0001$) and powerful others ($P = 0.012$) of FHLC. According to linear regressions model, internal MHLC ($P = 0.027$), internal dimensions ($P < 0.0001$), and powerful others ($P = 0.012$) of FHLC are considered as predictor variables of self-care.

CONCLUSION: Midwives should perform interventions to increase internal locus of control and encourage more responsibility among women with gestational diabetes to achieve better self-care.

Keywords:

Diabetes, fetus, gestational, locus of control, mothers, self-care

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Introduction

Gestational diabetes is the most common medical complication of pregnancy and is defined as any degree of glucose intolerance with onset or first recognition during pregnancy.[1] Some of the risk factors for gestational diabetes include age, history of diabetes in first-degree relatives, and high body mass index.[2]

The rate of gestational diabetes prevalence varies in different parts of the world from 1% to 14%, and in Iran, it has been reported from 1.3% to 8.9%.[3] Considering the fact that women with gestational diabetes have a 20%–50% chance of developing type 2 diabetes in the next 5–10 years, this high prevalence should not be considered transient.[4]

Gestational diabetes is associated with complications such as preeclampsia,

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polyhydramnios, difficult labor, and increased perinatal mortality.[5] The most important predisposing factor for mortality in patients with diabetes is the lack of self-care.[6] Self-care is an active process that patients with diabetes should attempt to follow every day to achieve good control of their disease.[7] The aim of self-care is to maintain the blood glucose level in the normal range, which is considered extremely important for the health of mothers and fetuses.[8] Physical activities, nutritional behaviors, and monitoring blood glucose levels are often used as variables related to self-care for diabetes patients.[9]

According to a study by Harizopoulou *et al*. in Greece, physical activity during pregnancy has a protective effect against impaired glucose tolerance and gestational diabetes.[10] Davenport *et al*.'s study in Canada showed that nutrition therapy with insulin therapy plus walking program lowered the demand for insulin and blood glucose levels in gestational diabetes mellitus (GDM) women.[11]

Successful treatment of patients with diabetes depends on the individuals' abilities to adopt self-care behaviors.[12] Understanding the psychological factors associated with self-care of patients provides the basis for educational planning.[13] Since glycemic control is associated with physiological and psychological mechanisms, variables such as health locus of control seem to play a role in health-related behaviors among diabetic patients.[4]

Health locus of control was derived from the social learning theory developed by Rotter in 1966.[14] Health locus of control means individual beliefs concerning health issues, based on the past experience. There are two types of orientations regarding the locus of control in individuals: those with internal locus of control have a strong belief in health behavior decision-making and take more responsibility for maintaining their own health. On the contrary, people with external locus of control (fate, chance, doctors, and powerful others) are those who usually act passively and do not directly take responsibility for their health.[4]

According to a study by Zarrabi *et al*., GDM women have external doctors health locus of control.[4] Gabry in research in Northern Virginia on Arab and non-Arab women showed that there was a significant direct relationship between internal health locus of control and health behaviors.[15] On the other hand, in Gregg *et al*. study on Indian men and women, the internal locus of control was significantly associated with higher levels of physical activity in men and women without diabetes; though, there was no significant relationship in diabetic patients.[16] According to some studies, patients who are more self-reliant and less dependent on others will probably have less collaboration with health-care providers, which in turn will have a negative impact on self-care practices of diabetic patients.[17] According to a study by Nikoogoftar, there is a positive correlation between self-care behaviors and external doctors health locus of control.[6] Moreover, Clements *et al*. and Koski-Jännes in their studies showed that there was a correlation between external locus of control and alcohol consumption.[18,19]

Moreover, assessing health locus of control during pregnancy in relation to fetal health is of utmost importance.[20] Fetal health locus of control (FHLC) is an important factor that is associated with health behaviors and psychosocial issues,[21] and it is the belief that mothers have about controlling their fetal health. FHLC has two dimensions; in this case, internal dimension suggests that the mother believes she has control on the fetal health, and if she believes that chance or other powerful individuals have control over it, she has external dimension.[22]

Spirito *et al*. showed in the USA that GDM women have internal FHLC.[20] According to reports, women with an external fetal locus of control take more risks during pregnancy whereas pregnant women with internal fetal locus of control are more likely to change their lifestyles and adopt positive health behaviors.[22] While according to the study by Spirito *et al*. in the USA on pregnant women with type 1 and 2 diabetes and nondiabetic women, there was no relationship between following a diet and FHLC.[20]

Due to diabetic complications of pregnancy, special attention should be paid to both medical and psychological dimensions to control it.[23] Therefore, giving special attention to psychological and social factors affecting self-care behaviors including health locus of control is an important step for managing the disease to reduce its complications. This issue has been less considered in previous studies.[6] On the other hand, there are significant inconsistencies in the previous studies. Therefore, the present study aims to predict self-care behaviors of women with gestational diabetes (criterion variable) based on maternal health locus of control (MHLC) and FHLC (predictor variables) in 2015 in obstetric clinics of public hospitals affiliated to Mashhad University of Medical Sciences (Omolbanin, Imam Reza, and Ghaem) and health-care centers in Mashhad.

Methods

This study is a descriptive, predictive correlational study that was conducted from June 10 to November 6, 2015, on 400 women with gestational diabetes referring to

obstetric clinics of public hospitals affiliated to Mashhad University of Medical Sciences (Omolbanin, Imam Reza, and Ghaem) and health-care centers in Mashhad. After getting approval from the Ethics Committee of the University, expressing objectives of the study, obtaining informed consent from eligible women with gestational diabetes, and by considering the ethical codes, the sampling was conducted. First, health centers of no. 1, 2, 3, Samen, and 5 were considered as one class (all centers of the city of Mashhad), and then from the list of existing centers in any of these classes (proportional to the total number of centers covered by each class), some centers were randomly selected as a cluster. From each cluster, several health centers were selected for sampling using the draw method according to the population (in proportion to the size), and the desired sample size was selected through convenient sampling from the selected clinics and health centers. The sample size was estimated 398 individuals based on the results obtained from a pilot study on thirty qualified women with gestational diabetes, and by considering the confidence level of 95% and test power of 80% and then by considering the loss of samples, 418 individuals were enrolled.

Inclusion criteria were as follows: the individuals must be Iranian and the resident of the city of Mashhad who has completed at least elementary education, the gestational diabetes has been diagnosed by a doctor and at least 1 week has passed from the diagnosis, the individuals were not suffering from speech and hearing disorders that impede the communication with the researcher, they were not addicted to drugs, had no history or being involved with other medical conditions, and they had singleton pregnancy and had cell phones. Exclusion criteria included termination of pregnancy before the end of follow-up and being hospitalized.

Data collection tools included demographic information and midwifery questionnaires, summary of diabetes self-care activities (SDSCA) developed by Toobert *et al*.,[24] multidimensional health locus of control scale - form C by Wallston *et al*.,[25] and FHLC scale by Labs and Wurtele.[26]

Self-care questionnaire was a short 14-item self-report instrument that investigated the dietary self-care activities (six questions), physical activity (two questions), monitoring blood glucose levels (three questions), insulin injections (one question), oral medication (one question), and smoking (one question) of the patients during the past 7 days. The answer to all questions except for smoking was in a way that people reported their self-care behaviors related to diabetes on a continuum from 0 (I have not done it on any day of the week) to 7 (I have done it every day). The question related to smoking was given a score of 0 or 1 based on usage or nonusage. Considering the fact that merely diet, physical activity, implementation of blood glucose levels monitoring, insulin injections or metformin consumption, or any of these cases together were recommended to the individuals, they responded to the questionnaire based on the type of treatment. Since individuals had different treatments, the number of questions that have been answered, and their scores were different. For homogenization of the total score of the questionnaire, the total score of each individual from the questionnaire was divided by the number of questions answered, and the final score of self-care was determined on the basis of 0–6.57.

Form C of multidimensional health locus of control scale by Wollaston contains 18 questions and responses to all items were on Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The total range of scores for the internal questions (six questions) and chance (six questions) were considered between 6 and 36 points for each of them and for the doctor questions (three questions) and others (three questions) were between 3 and 18 scores. Final criterion to measure health locus of control was based on scores obtained from each dimension of the health control separately. Since the number of questions related to doctor and other dimensions was different from the questions related to internal and chance dimensions, the score obtained from each dimension was divided by the number of questions of that dimension; therefore, the final score of each dimension was determined on the basis of 1–6 and the highest score reflected the strong belief in that control.

FHLC scale by Labs and Wurtele contained 18 items with three subscales of internal (six questions), chance and fate (six questions), and powerful others (six questions) and each question was on a 10-point Likert scale ranging from 0 to 9 (strongly disagree to strongly agree). Therefore, the scores of each subscale ranged from 0 to 54, and the highest score indicated the strong belief in that control.

The validity of self-care questionnaire and form C of multidimensional health locus of control scale by Wollaston and FHLC scale by Labs and Wurtele was determined by content validity method after being translated into Farsi. The reliability of the self-care questionnaire, form C of multidimensional health locus of control scale by Wollaston, and FHLC scale by Labs and Wurtele was obtained through Cronbach's alpha coefficient as $\alpha = 0.70$, $\alpha = 0.80$, and $\alpha = 0.79$, respectively.

At the beginning of the study, it took individuals about an hour to complete the questionnaires. The self-care questionnaire was completed three times. After the completion of the first version, two versions of self-care questionnaires were given to them to complete at the end of each week during the next 2 weeks, and

at the end of 2 weeks, they were asked to refer to health center or clinic to deliver them. One or two days before the visit, a phone call was made as a reminder. After 2-week follow-up, fasting blood glucose and 2 h postprandial glucose level were also recorded. The collected data were analyzed using SPSS Statistical Software version 16(IBM Company, Armonk, NY, U.S.A) and using Spearman's correlation coefficient tests and multiple and general linear regression models at the level of $\alpha \geq 0.05$.

Results

Eighteen individuals were excluded from the study (12 individuals have failed to deliver the questionnaires after follow-up, 1 individual had delivery before the end of the follow-up period, 3 individuals were hospitalized, and 2 women were not willing to continue their cooperation), resultantly, the final analysis was performed on 400 individuals.

The average age of individuals was 31.34 ± 5.6 years and average value of body mass index was 27.59 ± 4.8 kg/m^2. In addition, 224 individuals (56%) were from average socioeconomic status, 159 individuals (39.8%) had high school education, and 363 GDM women (90.8%) were homemakers. Three hundred and thirty-one participants (82.8%) had wanted pregnancies and 85 ones (21.2%) had a history of gestational diabetes. All 400 participants (100%) of the study were recommended diet, physical activity, and blood glucose levels monitoring; in addition, 124 individuals (31%) were recommended only to use insulin, 11 ones (2.75%) only to use metformin, and 11 ones (2.75%) were recommended to use metformin and insulin. Three hundred and seventy-one participants (92.8%) were interested in learning self-care activities. Table 1 shows mean and standard deviation of fasting blood glucose and 2 h postprandial glucose at the beginning of the study and after 2 weeks, and Table 2 illustrates mean and standard deviation of self-care scores and dimensions of MHLC and FHLC scores in women with gestational diabetes.

Among women with gestational diabetes, 68 (17%) had internal dimension, 23 (5.7%) had a chance, 282 individuals (70.5%) had doctors, and 27 ones (6.8%) had others MHLC. Moreover, 305 individuals (76.2%) had internal, 57 (14.3%) had a chance, and 38 (9.5%) had powerful others FHLC.

Spearman test results showed that there was a significant linear relationship between self-care and internal MHLC (P = 0.027); however, there was no significant linear relationship between self-care and other types of MHLC [Table 3].

Table 1: Mean and standard deviation of fasting blood glucose and 2 h postprandial glucose at the beginning of the study and after 2 weeks in women with gestational diabetes

Variable	Mean±SD	
	At the beginning of the study	2 weeks after the study
Fasting blood glucose (mg/dl)	107.93±34.7	95.67±22.3
2 h postprandial glucose (mg/dl)	154.38±43.6	129.55±38.1

SD = Standard deviation

Table 2: Mean and standard deviation of self-care scores and dimensions of maternal and fetal health locus of control scores in women with gestational diabetes

Variable	Mean±SD
Self-care	3.99±0.8
Internal dimension of maternal health locus of control	4.29±0.9
External chance dimension of maternal health locus of control	2.92±1.1
External doctors dimension of maternal health locus of control	5.06±0.9
External others dimension of maternal health locus of control	3.60±1.1
Internal dimension of fetal health locus of control after	46.94±6.7
External chance dimension of fetal health locus of control	35.82±10.5
External powerful others dimension of fetal health locus of control	35.57±10.9

SD = Standard deviation

Table 3: Spearman correlation coefficients between self-care and dimensions of maternal and fetal health locus of control

Variable	Spearman correlation coefficients between self-care and dimensions of maternal health locus of control		Spearman's correlation coefficients between self-care and dimensions of fetal health locus of control	
	r	*P*	*r*	*P*
Internal (mother and fetus)	0.11	0.027	0.18	<0.0001
External chance (mother and fetus)	0.03	0.437	−0.07	0.163
External doctors (mother)	0.05	0.267	-	-
External others (mother)	0.04	0.387	-	-
External powerful others (fetus)	-	-	0.12	0.012

Moreover, there was a significant linear relationship between self-care and internal ($P < 0.0001$) and external powerful others ($P = 0.012$) FHLC; however, there was no significant linear relationship between with self-care and external chance FHLC [Table 3].

Finally, the dimensions or subscales of MHLC (internal, chance, doctors, and others) were separately considered as independent variables, and the self-care was the dependent variable in the general linear regression

model and the results showed that only subscale of internal (P = 0.027) in this model had the significance level of <0.05, and it was considered as predictor variable of self-care. However, subscales of chance-external, external doctors, and external others had no significant relationship [Table 4]. The linear regression equation of predicting self-care based on the independent variable of internal MHLC:

Self-care score = 3.5 + (0.103 × score of internal MHLC) (Equation 1).

Moreover, the dimensions of FHLC (internal, chance, and powerful others) were separately considered as the independent variables, and self-care was the dependent variable in the general linear regression model. The results indicated that two subscales of internal (P < 0.0001) and external powerful others (P = 0.012) in this model had the significance level of <0.05, and they were considered as predictor variables of self-care. However, a subscale of chance-external had no significant relationship [Table 5]. The linear regression equation predicting self-care based on independent variables of internal and powerful others subscales of the FHLC:

Self-care score = 2.8 + (0.024 × score of internal FHLC) (Equation 2).

Self-care score = 3.6 + (0.010 × score of powerful others FHLC) (Equation 3).

Meanwhile, there was no significant linear relationship between self-care and fasting blood glucose level after 2-week follow-up (P = 0.373, r = 0.04); however, after a 2-week follow-up, there was a significant linear relationship between self-care and 2 h postprandial glucose level (P = 0.016, r = 0.12).

Examining the simultaneous effects of intervening variables on the relationship between MHLC and self-care using multiple regression test showed that among the studied variables except for the occupation variable (employed) that was removed from the regression model, other variables in total had significant multiple correlation with self-care (r = 0.240, P = 0.040, F = 1.812, df = 13). Moreover, among variables in the regression model, age variable (P = 0.033, β = 0.017) and a history of gestational diabetes (P = 0.034, β = 0.232) had a separate significant linear relationship with self-care.

Examining the simultaneous effects of intervening variables on the relationship between FHLC and self-care using multiple regression test showed that among the studied variables except for the occupation variable (employed) that was removed from the regression model, other variables in total had significant multiple correlation with self-care (r = 0.299, P < 0.0001, F = 3.173, df = 12). Moreover, among variables included in the regression model, age variable (P = 0.038, β = 0.017), and a history of gestational diabetes (P = 0.020, β = 0.251) had a separate significant linear relationship with self-care.

Table 4: Linear regression test results about the relationship between dimensions of maternal health locus of control and self-care

Variable	β	df	r	F	Test result (P)
Internal	0.103	1	0.111	4.928	<0.0001
External chance	0.031	1	0.039	0.605	0.437
External doctors	0.049	1	0.056	1.235	0.267
External others	0.033	1	0.043	0.751	0.387

Table 5: Linear regression test results about the relationship between dimensions of fetal health locus of control and self-care

Variable	β	df	r	F	Test result (P)
Internal	0.024	1	0.183	13.79	<0.0001
External chance	−0.006	1	0.07	1.955	0.163
External powerful others	0.01	1	0.126	6.387	0.012

Discussion

The aim of this study was to predict self-care behaviors among women with gestational diabetes based on MHLC and FHLC. The results of the present study showed that 70.5% of women with gestational diabetes had external doctors health locus of control. Since people with diabetes encounter with a lot of problems that negatively affect all aspects of their daily routines including personal communications, activities, and comfort, rather than relying on their internal locus of control, they rely on external control and recommendations and comments of their doctors.[27] In this regard, the study by Zarrabi *et al*. on 100 women, GDM women showed that the external doctors health locus of control among women with gestational diabetes had the highest frequency.[4] Whereas the study by Thomas *et al*. on men and women with type 1 and 2 diabetes using Locus of Control in Health Inventory (Lochi) (18 items) showed that beliefs in God as a locus of control among females, and beliefs in doctors among males with diabetes had the highest average.[28] The reasons for the difference between the present study and Thomas *et al*. study[28] may be due to differences in the study populations and the way to measure. The present study was conducted on women with gestational diabetes and form C of multidimensional health locus of control scale by Wollaston was used; however, the study by Thomas *et al*.[28] was done on males and females with diabetes type 1 and 2 using Lochi.

In addition, in the present study, most participants had internal FHLC. Psychological studies conducted

during pregnancy have shown that increasing interest and attachment to the child gradually increase during pregnancy and mothers appear to show greater self-care and self-control behaviors.[4] This explains the high internal locus of control and more sense of more responsibility for health of GDM mothers in this study. While Spirito *et al*. using FHLC scale by Labs and Wurtele showed that women with gestational diabetes had chance FHLC. Therefore, health behaviors related to the fetus are more influenced by chance.[20] In general, as the age increases, people tend to be internally oriented.[29] As a result, its average age of study participants can be mentioned as a reason for differences in the results of the present study in comparison with Spirito *et al*.'s study[20] because the average age of the present study was more than Spirito *et al*.'s study.[20]

The present study in relation to self-care showed that mean and standard deviation of self-care among women with gestational diabetes was 3.99 ± 0.8. Scores obtained on the self-care questionnaire ranged from 0 to 6.57; therefore, they obtained average self-care scores. Whereas in a study by Momeni Javid *et al*. in Tehran and using a questionnaire related to pregnancy self-care and a researcher-made questionnaire (13 questions) which ranged from 0 to 100, the mean score of self-care among women with gestational diabetes was 71.9, which was at a favorable level.[30] Hamadzadeh *et al*. conducted a study to determine the correlation between the coping styles and self-care behaviors on 285 type 1 and 2 diabetic patients in Tehran using SDSCA measure (15 items), which ranged from 0 to 99. Self-care mean score of participants was 51.4 which is an average score, and most individuals had poor and average self-care.[31] It seems that the difference in the self-care activities of people in the current study in comparison with studies of Momeni Javid *et al*.[30] and Hamadzadeh *et al*.[31] was due to differences in sample size, the way the patients measured self-care, and the research site. On the other hand, the studied populations in the present study were also different from Hamadzadeh *et al*. study.[31] In this study, the self-care questionnaire retrieved from SDSCA was used, and the individuals were followed up for 2 weeks for self-care, and the final score of self-care was the mean of 3 times measurements; therefore, the likelihood of forgetting self-care activities was reduced. However, Momeni Javid *et al*.[30] used a researcher-made pregnancy self-care questionnaire and Hamadzadeh *et al*.[31] used SDSCA measure and these questionnaires in both studies were merely completed at the beginning of the study through interviews. In addition, age is one of the factors affecting self-care, and since the average age of the current study was higher than Momeni Javid *et al*.'s study,[30] it can be considered as another reason for the difference in the present study compared to Momeni Javid's study.

The results of the present study showed that there was a significant linear relationship between the internal MHLC and self-care behaviors of women with gestational diabetes, and this dimension of MHLC predicted self-care. In other words, people with internal locus of control have a strong belief in health behavior decision-making and take more responsibility for maintaining their own health.[4] They find effective ways to manage stress[32] and are more likely to engage in health-promoting behaviors.[6] Patients who believe they can contribute to disease control and prevention refer to behaviors such as praying, changing diet, exercising, and performing social interaction to improve their life quality. In fact, people with health locus of control believe that they can control health, hygiene, and life quality, and they follow health behaviors which will help them recognize and control psychological stress.[33] In this respect, Gabry conducted a study in Egypt to determine the relationship between health behavior during pregnancy and health locus of control among Arab (n = 50) and non-Arab (50) women using form A of multidimensional health locus of control scale by Wollaston. The result showed that there was a significant direct correlation between internal health locus of control and health behaviors, and as the internal source increased, health behaviors increased; however, there was no relationship between health behaviors and powerful others and chance locus of control.[15] Habboushe conducted on 56 women with gestational diabetes using form C of multidimensional health locus of control scale by Wollaston and blood glucose monitoring report form. The results of the study revealed that there was no significant correlation between internal health locus of control and self-care in the dimension of blood glucose self-monitoring.[34] The differences between the results of the present study and the Habboushe's study[34] can be due to the effects of cultural, psychological and social differences which can affect the results of different studies. In addition, the present study has examined the relationship between health locus of control and total self-care activities whereas Habboushe's study,[34] merely investigated the health locus of control by blood glucose monitoring which is only one dimension of self-care. Moreover, the average internal health locus of control in the present study was less than Habboushe's study,[34] and this can be regarded as an explanation for inconsistency with this study.

In the present study, there was a significant direct linear relationship between the internal and powerful others' dimensions of the FHLC and self-care behaviors of women with gestational diabetes and these dimensions of FHLC predicted self-care. In general, people with internal locus of control accept more responsibility and take more active steps to fix the problem; furthermore, they are more likely to engage in treatment decisions.[4]

Moreover, diabetic patients with powerful others locus of control have a desirable relationship with their doctors and thus are more satisfied with their treatment.[6] Therefore, the positive impact of the relationship between patient and services' provider is important, and it is considered as one of the desirable factors affecting the patient's adherence to the treatment plan. It has been reported that among diabetic patients, satisfaction with the patient–provider communication is significantly associated with recovery and better metabolic control.[27] Spirito *et al*. conducted a study to determine MHLC and FHLC during pregnancy and comparison between women with type 1 and 2 diabetes and nondiabetic women, using FHLC scale by Labs and Wurtele and diet questionnaire. The results of their study showed that there was no relationship between diet and FHLC.[20] The inconsistency of Spirito *et al*.'s study[20] with the present study can be due to the differences in the populations under study. The Spirito *et al*.'s study[20] merely examined one dimension of self-care (diet). In fact, according to the findings of the present study, age is considered as one of the factors influencing the relationship between FHLC and self-care, and the average age of the present study was more than Spirito *et al*.'s study.[20] Rao conducted a study on 372 pregnant women using questionnaire of alcohol consumption in pregnant women (64 items) and FHLC (17 items) derived from multidimensional health locus of control scale by Wollaston. The results revealed that dimensions of the chance and powerful others predicted alcohol consumption in pregnant women.[35] One of the reasons of difference in the present study with the previous study can be attributed to the difference in the type of assessment tool employed for FHLC. Moreover, in the present study, the total self-care activities of GDM women were investigated whereas Rao[35] merely examined alcohol consumption in healthy pregnant women. Since culture affects health beliefs and attitudes, another reason for inconsistency of the present study with the two can be explained through cultural differences in different populations.[22]

In this study, after a 2-week follow-up, fasting blood glucose and 2 h postprandial glucose level reduced. Furthermore, there was a significant linear relationship between self-care and 2 h postprandial glucose level after a 2-week follow-up. Studies have also confirmed that in gestational diabetes, maintaining optimal blood glucose after meals are preferred to before eating.[1] In this study, the participants were advised by health-care workers such as midwives to follow self-care behaviors such as following a diet and physical activity, monitoring blood glucose, having timely and accurate insulin injection, or taking oral medication to lower blood glucose. Therefore, individuals enrolled into the study with information about self-care behaviors. On the other hand, in the early stages of gestational diabetes diagnosis, in the case of following a balanced a diet and doing regular exercise, 80% of women will achieve good control of blood glucose.[8] In addition, physical activity can lower fasting blood glucose and postprandial glucose,[36] and in some GDM women, it is likely to eliminate the need for insulin injections.[8] In this regard, the results of Davenport *et al*.'s study in Canada on thirty GDM women showed that nutrition therapy with insulin therapy plus walking program reduced the need for insulin injections and also reduced blood glucose levels in women with gestational diabetes.[11]

One of the limitations of this study was the use of self-report questionnaire for assessing self-care activities. The patients' responses were trusted, and after a 2-week follow-up, fasting blood glucose and 2 h postprandial glucose level were also recorded. There are also a number of strengths of the study. The individuals were followed up for 2 weeks for self-care, and self-care questionnaire was complete three times, once at start of the study and twice within 2 weeks after inclusion in the study, and the final score of self-care was the mean of these three measurements and as a result the possibility of forgetting self-care activities was reduced.

It is recommended that future studies focus on the effects of training MHLC and FHLC on stress and on promoting self-care in women with gestational diabetes.

Conclusion

According to the results of this study, dimension of internal MHLC and internal and powerful others dimensions of the FHLC predict self-care of women with gestational diabetes. Therefore, doctors, health-care providers, and midwives should be aware of MHLC and FHLC and they should educate GDM mothers to increase internal health locus of control and encourage them to take more responsibility to achieve better self-care.

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Conflicts of interest

There are no conflicts of interest.

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