DOI: 10.55646/jaren.galenos.2025.40360
J Acad Res Nurs 2025;11(3):152-62

The Impact of Nursing Education on Pregnancy Risk Perception and Diabetes Self-management in Pregnant Women Diagnosed with Gestational Diabetes Mellitus

Gestasyonel Diyabetüs Mellitüslü Gebelere Verilen Hemşirelik Eğitiminin: Gebelik Risk Algısı ve Diyabet Öz-Yönetimine Etkisi

Asibe Özkan[1], Füsun Afşar[2], Belgin Aygördü Hamitoğlu[3]

[1]University of Health Sciences Türkiye, Hamidiye Faculty of Nursing, Department of Obstetrics and Gynecology, İstanbul, Türkiye
[2]Maltepe University School of Nursing, Department of Internal Medicine Nursing, İstanbul, Türkiye
[3]University of Health Sciences Türkiye, Başakşehir Çam and Sakura City Hospital, Maternity Education Nurse, İstanbul, Türkiye

Cite this article as: Özkan A, Afşar F, Aygördü Hamitoğlu B. The impact of nursing education on pregnancy risk perception and diabetes self-management in pregnant women diagnosed with gestational diabetes mellitus. J Acad Res Nurs. 2025;11(3):152-62

ABSTRACT

Objective: The purpose of this study was to assess how self-management education for gestational diabetes mellitus (GDM), given to pregnant women with a GDM diagnosis, influences their perceived risk, diabetes self-management abilities, and perinatal outcomes.

Methods: This study was carried out between February and September 2024 at maternity education and research hospital. A total of 40 pregnant women participated, with 20 assigned to the control group and 20 to the individual education group. All participants were diagnosed with GDM by physician based on screening tests conducted at 24-28 weeks of gestation, and were referred to the diabetes nursing clinic. The women in the individual education group received weekly 40-minute training sessions over four weeks, conducted by a certified diabetes nurse and a certified prenatal education midwife. All data were analyzed using SPSS version 25.0.

Results: After the four-week diabetes self-management education, a comparison of the total scores of the Perception of Pregnancy Risk Questionnaire (PPRQ) and the Diabetes Self-Management Questionnaire (DSMQ) between the control and individual education groups revealed no significant difference in pregnancy risk perception between the two groups. However, the total DSMQ score showed a significant increase in the individual education group ($p<0.05$). No significant differences were observed between the groups in the sub-dimensions of the PPRQ; however, the sub-dimensions of the DSMQ, specifically glucose management, dietary control, and health care utilization, along with overall diabetes self-management, showed statistically significant improvements in the individual education group. Although within normal limits, the height and weight of the babies born to the mothers in the control group were statistically significantly higher compared to those in the individual education group.

Conclusion: The study revealed that diabetes self-management education delivered by midwives and nurses -the health care professionals most closely engaged with pregnant women- enhanced dietary management and risk perception during pregnancy.

Keywords: Gestational diabetes mellitus, self-management, pregnancy risk, education

ÖZ

Amaç: Bu çalışmanın amacı, gebelik diyabeti (GDM) tanısı alan gebe kadınlara verilen gebelikte GDM özyönetimi eğitiminin; gebelikte algılanan risk algısına, diyabet öz yönetimi düzeylerine ve perinatal çıktılara etkisini saptamak amacı ile yürütülmüştür.

Yöntem: Çalışma, Şubat-Eylül 2024 tarihleri arasında bir kadın doğum eğitim ve araştırma hastanesinde 24-28 gebelik haftalarında yapılan tarama testleri baz alınarak hekim tarafından GDM tanısı konulan ve diyabet hemşireliği polikliniğine yönlendirilen 40 (20 kontrol grubu, 20 bireysel eğitim

ORCID IDs: AÖ. 0000-0002-4278-5278; FA. 0000-0002-4421-3089; BAH. 0009-0006-3779-0087

Corresponding Author: Füsun Afşar,
E-mail: fusunafsar@maltepe.edu.tr

Received Date: 23.10.2024 **Accepted Date:** 21.08.2025
Publication Date: 02.12.2025

Copyright© 2025 University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital. Published by Galenos Publishing House on behalf of University of Health Sciences Türkiye, Gaziosmanpaşa Training and Research Hospital. This is an open access article under the Creative Commons AttributionNonCommercial 4.0 International (CC BY-NC 4.0) License.

Copyright© 2025 Sağlık Bilimleri Üniversitesi Gaziosmanpaşa Eğitim ve Araştırma Hastanesi. Sağlık Bilimleri Üniversitesi, Gaziosmanpaşa Eğitim ve Araştırma Hastanesi adına Galenos Yayınevi tarafından yayımlanmıştır. Creative Commons Atıf-GayriTicari 4.0 Uluslararası (CC BY-NC 4.0) Uluslararası Lisansı ile lisanslanmış, açık erişimli bir makaledir.

grubu) gebe ile gerçekleştirildi. Bireysel eğitim grubuna dahil edilen gebelere sertifikalı diyabet hemşiresi ve sertifikalı gebe eğitim ebesi tarafından dört hafta boyunca haftada bir gün, her biri 40 dakikadan oluşan gestasyonel diyabet ve gebelik ile ilgili öz yönetim becerilerini desteklemeyi amaçlayan eğitimler verildi. Araştırma verilerinin toplanmasında, "Gebelerin Tanıtıcı Özellikleri Formu", "Diyabet Öz Yönetim Skalası (DSMQ)", "Gebelikte Risk Algısı Ölçeği (GRAÖ)" kullanıldı. Araştırmadan elde edilen veriler, SPSS 25.0 (IBM, Armonk, NY, USA) programı kullanılarak değerlendirildi.

Bulgular: Dört haftalık diyabet öz bakım eğitimi sonrası, kontrol ve bireysel eğitim gruplarındaki gebelerin PPRQ ve DSMQ toplam puanları karşılaştırıldığında; iki grup arasında gebelik risk algısı açısından farka rastlanmaz iken, DSMQ toplam puanının bireysel eğitim grubunda anlamlılık yaratacak düzeyde artığı saptandı ($p<0,05$). GRAÖ alt boyutları açısından iki grup arasında farka rastlanmaz iken, DSMQ alt boyutları olan; glikoz yönetimi, diyet yönetimi, sağlık hizmetlerini kullanma ve diyabet öz yönetim puanları açısından istatistiksel açıdan anlamlı farklılık olduğu bulundu. Normal sınır aralıklarında olmakla birlikte kontrol grubundaki gebelerin bebeklerinin boy ve kilolarının bireysel eğitim grubundaki bebeklere oranla daha yüksek olduğu ve bu farkın istatistiki açıdan anlamlı olduğu görüldü.

Sonuç: Gebelikte kadına en yakın olan ve en çok vakit geçiren sağlık profesyonelleri olan ebe ve hemşireler tarafından verilen diyabet öz yönetimi diyet, yaşam davranışları değişikleri ve sağlık kuruluşlarından yararlanmayı olumlu etkilediği ve perinatal göstergeler üzerine de olumlu etkilerinin olduğu saptandı.

Anahtar kelimeler: Gestasyonel diyabet, öz yönetim, gebelikte risk algısı, eğitim

INTRODUCTION

Gestational diabetes mellitus (GDM) is the most common metabolic complication of pregnancy, characterized by hyperglycemia that is first identified during pregnancy in women without a prior history of diabetes, and presents potential risks to both the mother and fetus, necessitating careful management to mitigate adverse outcomes [1-3]. According to the International Diabetes Federation, in 2021, there were 21.1 million pregnancies with excessive hyperglycemia, and 80% of these were GDM pregnancies [4]. The rising prevalence of GDM is a leading cause of maternal and infant mortality and morbidity worldwide. Women with GDM face increased risks of pregnancy-related hypertension, preeclampsia, infections, preterm birth, and cesarean delivery [2,3,5]. Additionally, their children are at a higher risk for adverse pregnancy outcomes such as macrosomia, congenital anomalies, neonatal hypoglycemia, shoulder dystocia, and respiratory distress syndrome, as well as long-term health issues such as hypertension, obesity, and diabetes [2,5-7]. To improve maternal and newborn health, women with GDM are required to adopt multiple, often challenging lifestyle changes (diet and exercise), monitor blood glucose levels, and use various hypoglycemic agents [2,5,7]. Successful self-management is a crucial aspect of GDM care, requiring a reduction in caloric intake by substituting high-calorie foods with healthier alternatives, encouraging increased physical activity to enhance metabolism, and consistently monitoring blood glucose levels, which empowers pregnant women to effectively manage their GDM and minimize potential complications [5,8,9]. The primary goal of GDM treatment is to maintain blood glucose within the recommended range, which can be achieved through these healthy lifestyle interventions (diet and physical activity) [3,5]. However, if self-management is not adequately addressed in women with GDM, the morbidity rates for both the mother and baby can be two to three times higher. However, these risks can be significantly reduced with proper management of GDM, emphasizing the importance of timely interventions and effective care strategies [10]. Perception of risk during pregnancy and childbirth is a complex process influenced by multiple factors. For pregnant women, the primary concern related to risk perception shaped by pregnancy-specific risk factors is the well-being of their baby [11-13]. Another significant source of anxiety is the worry that dietary programs may be too restrictive and fail to provide all the necessary nutrients for the baby [13]. Risk perception can be influenced by various elements, including perceptions, expectations, previous life experiences, high-risk pregnancies, fear induced by stress, and information received from different sources [11,13]. The intensity of risk perception impacts attitudes towards treatment, maternal decision-making during pregnancy, and adherence to medical procedures and recommendations [11]. A study involving women with GDM reported that a low-risk perception for developing type 2 diabetes mellitus hindered their ability to make lifestyle changes [14]. Similarly, other studies indicated that low-risk perceptions led some women with gestational diabetes to believe that their condition was temporary [15,16], which may cause them to disregard further interventions and treatments, ultimately leading to neglect in self-management [17]. Therefore, it is essential that health care professionals, especially nurses, effectively manage risk perception to enhance self-management and self-efficacy among women with GDM [3]. Given the risks posed by GDM to both mothers and babies, it is crucial to identify strategies that support women in managing their condition [5]. Health education interventions are one of the key components in managing GDM, as they help improve self-management skills, blood glucose monitoring, healthy lifestyle changes, and decision-making [16,18-20]. In this context, education is one of the most effective strategies for supporting self-management in women with GDM. The closest and most effective sources of support for providing counseling and education to these women are diabetes nurses and midwife-nurses who monitor pregnancies. The purpose of this study was to assess how GDM self-management education influences pregnant women diagnosed with GDM, specifically examining its effects on their perceived risk, diabetes self-management skills, and perinatal outcomes.

Hypotheses

- H_0: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis does not affect diabetes self-management.

- H_1: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis does not affect perceived risk levels during pregnancy.
- H_2: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis does not affect perinatal outcomes.
- H_3: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis affects diabetes self-management.
- H_4: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis affects perceived risk during pregnancy.
- H_5: Individual education provided to pregnant women diagnosed with gestational diabetes immediately following their diagnosis affects perinatal outcomes.

MATERIAL AND METHOD

This study aimed to assess the effects of GDM self-management education on pregnant women diagnosed with GDM, focusing on their perceived risk during pregnancy, diabetes self-management levels, and perinatal outcomes. Conducted between February and September 2024 at a maternity education and research hospital, the study included pregnant women who were diagnosed with GDM by a physician following screening tests performed at 24-28 weeks of pregnancy, and subsequently referred to the diabetes nursing clinic. Ethical approval was obtained from the University of Health Sciences Türkiye, Başakşehir Çam and Sakura City Hospital Ethics Committee (approval no.: 78, date: 31.01.2024), and the study was carried out in compliance with the Helsinki Declaration. The researchers provided a verbal explanation of the study's purpose and procedures to all participants, and written informed consent was obtained from each volunteer before data collection was completed.

Population and Sample

The population of this study consisted of pregnant women diagnosed with GDM who visited the relevant institution during the study period. To determine the minimum required sample size, a power analysis was conducted based on similar studies [5,9]. According to the power analysis, with an effect size of 0.754, a significance level of 0.05, a confidence level of 95%, and a test power (1-β) of 80% for a two-tailed hypothesis, the optimal number of female participants was calculated as 20. Therefore, the total sample size for the study was determined to be 40 pregnant women (20 in the control group, 20 in the individual education group). Inclusion criteria for the study were as follows: (i) being diagnosed with GDM, (ii) having a singleton pregnancy, (iii) being 18 years or older, (iv) volunteering to participate, (v) being able to read and understand Turkish, and (vi) having no communication problems (such as hearing or speech impairments), and (vii) not having any diagnosed psychiatric disorders. Exclusion criteria included: (i) twin pregnancies, (ii) the presence of an additional risk factor along with GDM during pregnancy, and (iii) giving birth before 36 weeks of gestation.

Randomization

For the pregnant women who met the sample selection criteria, randomization was conducted using the random integer generator available on the website random.org. Columns were created within the 1-40 range (Random.Org). The numbers 1 and 2 were assigned to each participant randomly, representing the allocation to either the intervention or control group. At the beginning of the study, these numbers were designated to represent the experimental and control groups through a lottery method. The pregnant women assigned the number 1 were placed in the individual education group, while those assigned the number 2 were placed in the control group. The study's CONSORT diagram is presented in Figure 1.

The 20 pregnant women who met the inclusion criteria and were assigned the number 1 were placed in the control group. This group received standard care in accordance with hospital

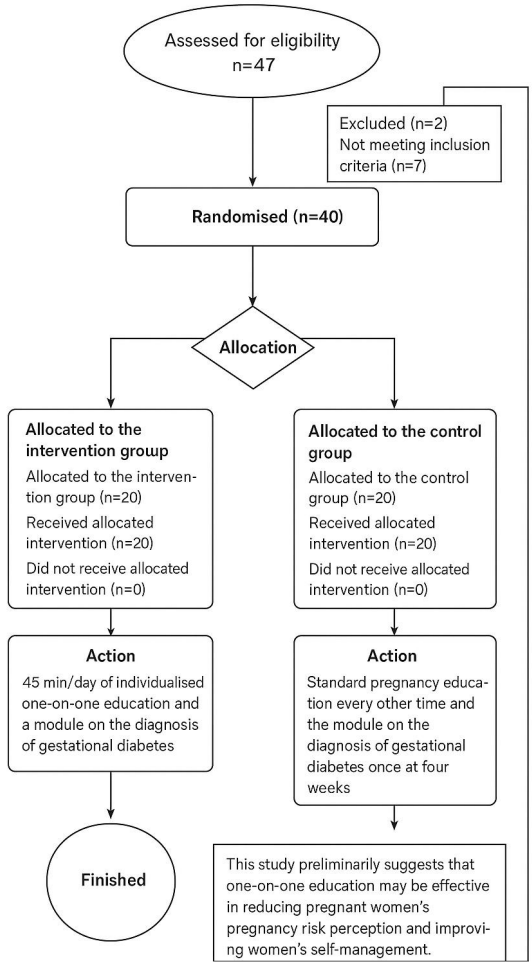


Figure 1. Research CONSORT Diagram

protocols, which included personalized instruction from a diabetes education nurse. The instruction covered self-administration of insulin (if prescribed), monitoring of blood glucose levels, and education on GDM management during pregnancy. The pregnant women assigned the number 2, who were placed in the individual education group, received a more comprehensive education program. This program was delivered by a certified diabetes nurse and a certified prenatal education midwife over a four-week period, with weekly 40-minute sessions. The sessions covered various self-management skills related to gestational diabetes and pregnancy, including blood glucose monitoring, insulin administration and tracking, GDM nutrition, weight control, diet, self-management, physical activity, healthy lifestyle behaviors, utilization of health care services, and follow-up care. Since the education was provided individually, the dates for each session were scheduled during the previous session based on the participant's availability.

Training Program

Week 1: Definition and Symptoms of Gestational Diabetes

What is gestational diabetes? What are its symptoms? (What causes it? Is it permanent or temporary?)

The role of sugar in the body and its effects on pregnancy and fetal development.

Home blood sugar monitoring and evaluation, recording.

Special educational needs of pregnant women.

Week 2: Antidiabetic Medications Used During Pregnancy

What are the medications used, and how should they be administered?

Importance of insulin therapy, types and effects, injection sites and site rotation, as well as the side effects of therapy and storage considerations for insulin.

Special educational needs of pregnant women.

Week 3: Gestational Diabetes and Diet

Importance of nutrition, meal planning, essential nutrients affecting blood sugar levels: carbohydrates.

Snack options (sample menus, recipes).

Diet and fetal development.

Special educational needs of pregnant women.

Week 4: Effects of Gestational Diabetes on Maternal and Child Health

Acute complications and prevention of gestational diabetes.

Self-care and self-sufficiency in gestational diabetes (pregnancy-week appropriate exercise activities, self-care, hygiene).

Special educational needs of pregnant women.

Referral to Diabetes Nursing Clinic

All pregnant women who are diagnosed with gestational diabetes and visit the prenatal clinic are referred to the diabetes nursing clinic, where they receive education on topics such as gestational diabetes and blood sugar monitoring, and insulin usage. Additionally, information is provided regarding the weekly training sessions for the study group and they are notified that they may participate if they wish. Pregnant women who indicate that they cannot attend are included in the control group. Those who express they cannot attend are informed that they can join at any time, and the information is personally conveyed during pregnancy school registration. Moreover, information brochures on gestational diabetes are also provided to the women in the control group. Regardless of their group, pregnant women may receive postpartum follow-up care from the postpartum clinic at any time after delivery. This information is provided to all pregnant women during discharge education in the hospital.

Compliance with the Educational Program

Trainings for willing participants in the study group are scheduled based on the dates and times requested by the pregnant women, coordinated with prenatal clinic appointments and/or examinations like ultrasounds (scheduled half an hour before or after the appointments). Additionally, follow-up appointments for all participants of the pregnancy school and/or those attending these trainings are scheduled by the hospital for advanced ultrasounds, tests, etc.

Data Collection

The study data were collected through face-to-face interviews conducted by a diabetes education nurse in a room that ensured patient privacy. The Descriptive Characteristics Form for Pregnant Women', the Diabetes Self-Management Questionnaire (DSMQ), and the Perception of Pregnancy Risk Questionnaire (PPRQ) were administered to the pregnant women who were referred to the diabetes nursing clinic after their initial diagnosis but had not yet begun education. For the individual education group, the scales were applied for the second time following the completion of a four-week education program, while for the control group, the scales were re-administered during the first hospital visit, which took place at least four weeks after the initial assessment. The data related to childbirth, including the baby's weight, length, and appearance, pulse, grimace, activity, and respiration (APGAR) scores, were obtained from the postnatal information management system and recorded on the Descriptive Characteristics Form. The data collected through face-to-face interviews were gathered in approximately 25-30 minutes.

Data Collection Tools

The data for the study were collected using the Descriptive Characteristics Form for Pregnant Women, the DSMQ, and the PPRQ [21,22].

Descriptive Characteristics Form for Pregnant Women

This form was developed by the researcher based on relevant literature. It consists of 30 questions related to personal, obstetric, and gynecological characteristics. The personal characteristics section includes questions regarding age, education level, marital status, occupation, income level, family type, height-weight, smoking/alcohol use, family history, and the presence of chronic diseases. The obstetric and gynecological section covers questions about the number of pregnancies, gestational week, weight gained during pregnancy, number of live births, and age at first menstruation. The section for data obtained from patient files includes information related to childbirth, such as the baby's weight, length, and APGAR score.

Diabetes Self-Management Questionnaire (DSMQ)

The DSMQ is a 16-item self-assessment scale widely used in studies to evaluate the relationship between diabetes self-management and glycemic control among diabetic patients. The scale is in a four-point Likert format and consists of four sub-dimensions: glucose management, dietary control, physical activity, and healthcare use. Scores range from 0 to 10, with higher scores indicating better diabetes self-management. In the Turkish adaptation of the scale [21], the Cronbach's alpha value was found to be 0.85 study, and the Cronbach's alpha value of the scale was calculated as 0.86.

Perception of Pregnancy Risk Questionnaire (PPRQ)

The PPRQ was developed by Heaman and Gupton in 2009 to assess the risk perception of pregnant women. The scale consists of nine items and is a visual analog measurement tool. It has two sub-dimensions: risk to baby and risk to self. Below each item, there is a 0-100 mm linear line with labels ranging from "no risk at all" to "extremely high risk". The total score is calculated by summing the scores for each of the nine items and dividing the total by nine. A higher score indicates an increased perception of risk related to the woman and her baby. In the Turkish validity and reliability study of the scale [22], the total Cronbach's alpha coefficient was found to be 0.84. For this study, the Cronbach's alpha value of the scale was calculated as 0.95.

Statistical Analysis

The data obtained from the study were analyzed using the SPSS 25.0 (IBM, Armonk, NY, USA) software. Since the data followed a normal distribution, descriptive statistics, independent t-test, One-Way ANOVA, and Pearson correlation tests were applied. The results were evaluated at a 95% confidence interval, and the significance level was set at $p<0.05$.

RESULTS

The distribution of the descriptive characteristics of the pregnant women in the individual education and control groups, along with their comparisons, is presented in Table 1. No statistically significant differences were found between the groups in terms of age, education level, employment status, or income level ($p>0.05$), indicating that the two groups were similar in terms of their descriptive characteristics. However, it was observed that the body mass index (BMI) was higher in the individual education group, and that this difference was statistically significant between the groups ($p<0.05$). There is no smoking or alcohol use in the control and individual education groups.

There were no statistically significant differences between the groups regarding age at first menstruation, total number of pregnancies, gestational week, weight gained during pregnancy, the week of referral to the diabetes clinic, mode of delivery, family history of diabetes, regular blood glucose monitoring during pregnancy, and insulin use ($p>0.05$), indicating that the two groups had similar descriptive characteristics. However, it was found that the gestational week at delivery in the control group was two weeks later than that in the individual education group, and that this difference was statistically significant ($p<0.05$) (Table 2).

When comparing the babies of the pregnant women in the control and individual education groups in terms of birth weight and length, as presented in Table 3, it was observed that although both groups were within the normal range, the babies in the control group had higher birth weights and lengths compared to those in the individual education group. This difference was found to be statistically significant ($p<0.05$). In contrast, the APGAR scores were similar between the two groups, with no statistically significant difference observed ($p>0.05$).

It was found that the women in the individual education group demonstrated significantly higher engagement in pregnancy-related information-seeking behaviors compared to the control group, and that this difference was statistically significant ($p<0.05$). However, no statistically significant differences were found between the two groups in terms of paying attention to healthy eating habits, exercising regularly, or developing good sleep habits ($p>0.05$), indicating that both groups exhibited similar characteristics in these aspects (Table 4).

When comparing the initial evaluation scores of the PPRQ and DSMQ and their sub-dimension, it was found that the total DSMQ score was higher in the individual education group, and that this increase was statistically significant ($p<0.05$). However, no significant differences were observed in the scores of the other sub-dimensions ($p>0.05$). After the four-week diabetes self-management education, a comparison of the total PPRQ and DSMQ scores between the control and individual education groups revealed no significant difference in pregnancy risk perception. However, the total DSMQ score showed a statistically significant increase in the individual education group ($p<0.05$). While there were no significant differences between the two groups in the sub-dimensions of the PPRQ ($p>0.05$), there were statistically significant differences in the DSMQ sub-dimensions, including glucose management (Graph 1D), dietary control (Graph 1E), health care use (Graph 1G), and diabetes self-management (Graph 1H) ($p<0.05$) (Table 5, Graph 1).

Table 1. Distribution and Comparison of the Descriptive Characteristics of Pregnant Women in the Control and Individual Education Groups					
	Control group		Individual education group		p
BMI	30.550±3.84		34.750±6.39		2.516 0.016
	n	**%**	**n**	**%**	
Age					
1-18-25	1	5	0	0	1.268 0.531
2-26-35	15	75	17	85	
3-36-45	4	20	3	15	
Education					
1. Primary school	3	15	0	0	5.978 0.095
2. Middle school	5	25	8	40	
3. High school	6	30	8	40	
4. Undergraduate degree	4	20	4	20	
5. Graduate degree	2	10	0	0	
Working status					
Yes	2	10	5	25	1.558 0.204
No	18	90	15	75	
Income status					
1. Income less than expenses	2	10	6	30	3.290 0.193
2. Income equal to expenses	17	85	14	70	
3. Income more than expenses	1	5	0	0	
BMI: Body mass index					

Table 2. Comparison of the Obstetric and Diabetes History of Pregnant Women in the Control and Individual Education Groups					
	Control group		Individual education group		p
Age at first menstruation	13.30±1.21		13.15±1.13		-0.403 0.689
Total number of pregnancies	2.10±1.07		2.65±0.98		1.688 0.100
The week of referral to the diabetes clinic	32.15±3.80		31.00±2.75		-1.096 0.280
Weight gained during pregnancy	12.20±4.07		10.35±4.23		-1,408 0.167
Gestational week at delivery	37.90±1.51		35.85±2.96		-2.755 0.009
	n	**%**	**n**	**%**	**p**
Delivery type					
Vaginal delivery	5	25	5	25	0.000 0.642
Cesarean section	15	75	15	75	
Is there a family history of diabetes?					
1. Yes	7	35	9	45	0.417 0.519
2. No	13	65	11	55	
Was regular blood sugar monitoring performed during pregnancy?					
1. Yes	8	40	5	25	1.151 0.562
2. No	8	40	9	45	
3. Rarely	4	20	6	30	
Insulin use					
1. Yes	4	20	5	25	1.244 0.537
2. No	16	80	15	75	

Table 3. Comparison of the Newborn Variables at Delivery Between Pregnant Women in the Control and Individual Education Groups			
	Control group	Individual education group	p
Baby's birth weight	3465.750±655.232	2866.2500±715.456	-2.764 0.009
Baby's length	51.750±2.425	49.200±4.187	-2.357 0.024
Baby's APGAR score at 1 minute	7.100±1.518	7.000±1.589	-0.203 0.840
Baby's APGAR score at 5 minutes	8.550±0.944	8.450±0.998	-0.325 0.747
APGAR: Appearance, pulse, grimace, activity, and respiration			

Table 4. Comparison of Healthy Lifestyle Behavior Variables Between Pregnant Women in the Control and Individual Education Groups					
	Control group		Individual education group		
	n	%	n	%	p
Healthy eating habits					
1. Yes	19	95	16	80	2.057 0.342
2. No	1	5	4	20	
Regular exercise					
1. Yes	1	5	2	10	0.360 1.000
2. No	19	95	18	90	
Developing good sleep habits					
1. Yes	1	5	4	20	2.057 0.342
2. No	19	95	16	80	
Seeking information on pregnancy					
1. Yes	4	20	20	100	26.667 0.000
2. No	16	80	0	0	

When comparing the initial and final evaluations of the PPRQ and DSMQ scores in the control group, it was observed that the PPRQ scores decreased and that the DSMQ scores increased; however, these changes were not statistically significant ($p>0.05$). In the individual education group, an analysis of the PPRQ and DSMQ scores before and after the four-week self-management education revealed a decrease in PPRQ scores and an increase in DSMQ scores. Furthermore, there were statistically significant changes in all sub-dimensions, except for risk to self and physical activity ($p<0.05$). Comparison of pre-test and post-test mean scores for PPRQ and DSMQ, including overall scores and sub-dimension results.

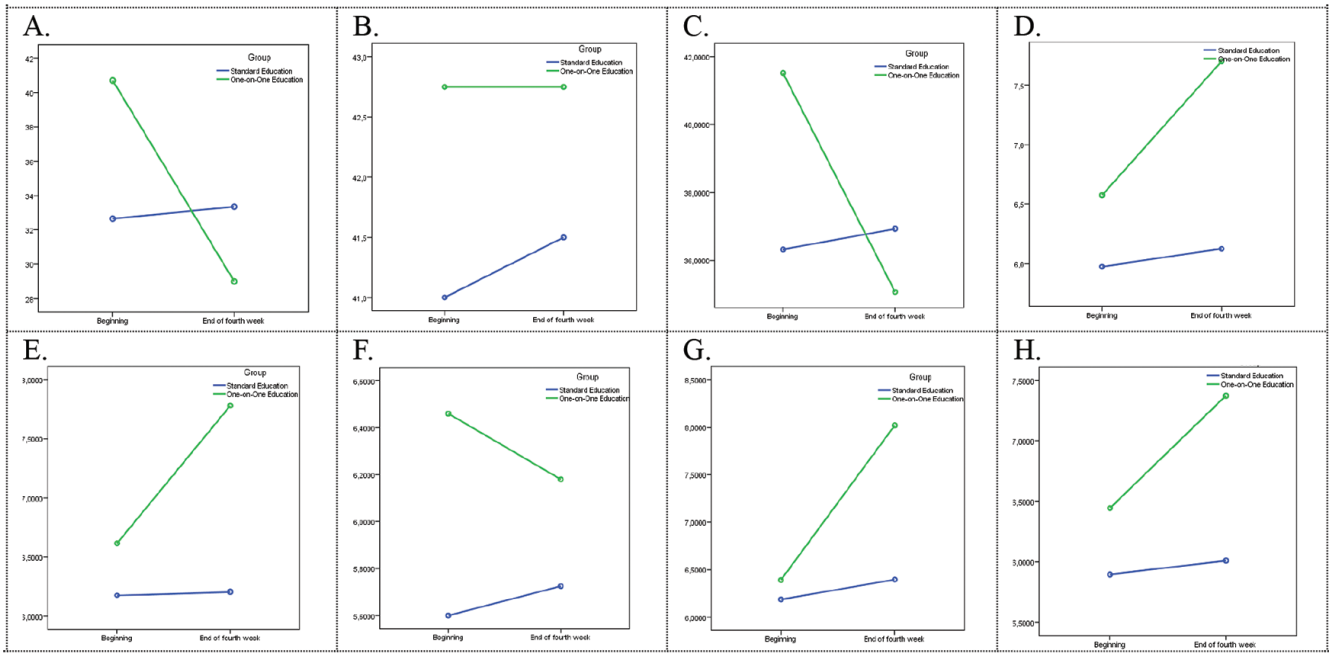
DISCUSSION

Tight glycemic control and self-monitoring of glucose levels, along with adopting healthy lifestyle behavior changes, are essential for reducing pregnancy complications related to GDM. These interventions require women to quickly learn and adopt challenging self-management skills in a short time. Health education is a fundamental component of care for successful GDM management and rapid adaptation to these changes [23-26].

This study was conducted in light of the need for research and evidence on the impact of component face-to-face nursing education and counseling on self-management in pregnant women with GDM, a condition with high prevalence in Türkiye and known to have negative effects on maternal and infant health.

Controlling weight gain during pregnancy, which is a modifiable risk factor for adverse pregnancy outcomes, contributes to the early detection, prevention, and intervention of negative perinatal outcomes [25,26]. In a study conducted in China involving a retrospective review of prenatal medical information from 41.845 pregnant women, a high BMI in early pregnancy was identified as a risk factor for gestational diabetes, whereas an increase in BMI before gestational risk screening was not found to be associated with an increased risk of GDM [27]. In the present study, the BMI of the pregnant women in the individual education group was higher at the start of the study compared to the control group. Given that an increase in BMI before gestational risk screening was not linked to an increased risk of GDM in the literature, this difference was not expected to affect the study's outcomes.

Studies have described pregnancy as a "window of opportunity" both for identifying women at risk of future health conditions and



Graph 1. Comparison of Pre-test and Post-test Mean Scores for PPRQ and DSMQ, Including Overall Scores and Sub-dimension Results, in the Experimental and Control Groups
(A) Risk to baby, (B) Risk to self, (C) Perception of pregnancy risk, (D) Glucose management, (E) Dietary control, (F) Physical activity, (G) Health care use, (H) Diabetes self-management, Green line: One-on-one education, Blue line: Standard education
PPRQ: Perception of Pregnancy Risk Questionnaire, DSMQ: Diabetes Self-Management Questionnaire

for promoting lifestyle changes [28,29]. In women with a history of GDM, a perceived low risk may act as a barrier to adopting risk-reducing lifestyle changes, while a well-managed and perceived level of risk can play a significant role in adopting preventive health behaviors [29]. When examining the results of various studies, it has been found that women often experience anxiety, fear, and panic upon receiving a GDM diagnosis, with many expressing that changing their eating habits and engaging in exercise are particularly challenging adjustments [30]. A statistically significant positive correlation between risk perception and exercise behavior has also been identified [31]. Moreover, many women diagnosed with GDM tend to underestimate their personal risk of developing diabetes later in life [29]. The literature indicates that pregnancy risk perception may be related to factors such as the number of births, maternal age, and pregnancy complications, underscoring the importance of individualized assessments [32]. At the beginning of this study, risk perception scores were similar for both groups. However, as the study progressed, the individual education group showed a decrease in sub-dimension scores related to the perception of risk to baby and overall pregnancy risk, while the control group exhibited an increase in these scores. This result was attributed to the ability of the women in the individual education group to express themselves and their concerns more comfortably, directly address their uncertainties and anxieties, and receive answers, leading to better management of their risk perception.

Knowledge of GDM is crucial for its effective management. Health education provided to women is highly effective in increasing their knowledge about the disease, correcting any misconceptions, preventing complications related to the condition, and enhancing their self-management skills [16,33]. Studies on improving self-efficacy emphasize the importance of personalized and customizable approaches to enhance the effectiveness of GDM management practices, facilitate changes in habits, and make goals more achievable [34]. Studies on improving self-efficacy highlight the importance of personalized and customizable interventions in increasing the effectiveness of GDM management practices, facilitating changes in habits, and making goals more attainable [34]. A systematic review of 70 studies emphasizes that when pregnant women with gestational diabetes reach a certain level of self-management and self-efficacy, they can positively control their diet and body weight [3]. Haron et al. [16] conducted a review of 19 studies to explore self-management strategies, educational content, and their effectiveness for women with GDM. Their findings highlight the significant positive impact these interventions have on the management of GDM. These include improved self-management behaviors, higher satisfaction scores, enhanced self-efficacy, better glucose control, and improved pregnancy outcomes. In this study, both the control and individual education groups showed an increase in total diabetes self-management scores and scores across all sub-dimensions, except for physical activity. However, in the intra-group comparisons, the self-management scores of the women in the individual education

Table 5. Comparison of Pre-test and Post-test Mean Scores for PPRQ and DSMQ, Including Overall Scores and Subdimension Results, Both Within and Between the Control and Individual Education Groups

	Scale and their sub-dimensions initial evaluation		Control group			Individual education group				
			After 4 weeks	p-value	Initial evaluation	After 4 weeks	p-value	Inter-group baseline comparison (t;p)	Inter-group post-assessment comparison (t;p)	
PPRQ	Risk to baby	Mean ± SD	32.65±16.56	33.35±16.70		40.70±10.72	29.00±8.14		1.824	-1.047
		Intragroup difference (t;p)	-0.082		0.935	3.885		0.000	0.076	0.302
	Risk to self	Mean ± SD	41.00±19.77	41.500±18.83		42.75±7.56	42.75±7.56		0.370	0.275
		Intragroup difference (t;p)	-0.116		0.908	0.000		1.000	0.714	0.785
DSMQ	Perception of pregnancy risk	Mean ± SD	36.32±16.72	36.93±16.43		41.51±8.00	35.06±6.97		1.253	-0.467
		Intragroup difference (t;p)	-0.133		0.895	2.717		0.010	0.218	0.643
	Glucose management	Mean ± SD	5.97±1.32	6.12±1.46		6.57±1.07	7.70±0.69		1.572	4.336
		Intragroup difference (t;p)	-0.340		0.736	-3.918		0.000	0.124	0.000
	Dietary control	Mean ± SD	6.17±1.19	6.20±1.13		6.61±1.13	7.78±0.84		1.192	4.964
		Intragroup difference (t;p)	-0.081		0.936	-3.681		0.001	0.241	0.000
	Physical activity	Mean ± SD	5.60±1.35	5.72±1.26		6.46±1.39	6.18±1.15		1.979	1.189
		Intragroup difference (t;p)	-301		0.765	0.693		0.493	0.06	0.242
	Health-care use	Mean ± SD	6.18±1.56	6.39±1.35		6.39±1.69	8.02±0.72		0.398	4.725
		Intragroup difference (t;p)	-0.454		0.652	-3.959		0.000	0.693	0.000
	Diabetes self-management	Mean ± SD	5.89±0.94	6.01±0.93		6.44±0.66	7.37±0.41		2.118	5.951
		Intragroup difference (t;p)	-0.386		0.702	-5.276		0.000	0.041	0.000

PPRQ: Perception of Pregnancy Risk Questionnaire, DSMQ: Diabetes Self-Management Questionnaire, SD: Standard deviation

group increased significantly before and after the intervention. Despite the higher initial BMI of the women in the individual education group, their babies' birth weights were lower compared to the control group, and the average birth weight was below the threshold for macrosomia, a common complication of GDM. In a randomized controlled study conducted in China, a couple-based intervention program was applied to the intervention group, while the control group received individual GDM education. At the end of the program, GDM knowledge and self-management improved significantly in both groups, but greater improvement was observed in the intervention group. Consistent with this study, the babies' birth weights in the intervention group were also found to be significantly lower [2]. A review of 30 qualitative studies that examined the self-reported barriers to self-management among pregnant women with GDM categorized the obstacles into three main themes: (a) knowledge and beliefs, (b) skills and abilities, and (c) environment and social support. Under the subtheme of physical limitations in the "skills and abilities" theme, it was

reported that pregnant women were more prone to fatigue, may suffer from pelvic and perineal pain, and may experience more mobility issues compared to the general population. These factors were identified as barriers to maintaining a regular exercise routine for women with GDM [20]. In this study, no progress was observed in the physical activity sub-dimension of diabetes self-management for either the individual education group or the control group. Although health care providers often recommend maintaining or increasing physical activity during pregnancy, these recommendations may not be persuasive enough to overcome traditional beliefs and perceptions that pregnancy requires extra care, rest, and recovery [35,36]. The lack of change in the physical activity sub-dimension in both groups could be linked to the prevailing cultural perspective in our society.

Study Limitations

This study has certain limitations. The study was conducted in a single center, which may limit the generalizability of the findings. Additionally, the small sample size and short follow-up period may have influenced the outcomes. Future multicenter studies with larger sample sizes and longer follow-up periods are recommended to confirm these results.

CONCLUSION

Women need to recognize their potential for a safe pregnancy, and one of the most effective ways to achieve this is through educational and counseling interventions. This study found that individualized GDM self-management education and counseling provided by nurses facilitated and positively impacted women's management of perceived pregnancy risk. As women's knowledge levels increased, their perceived risk decreased, which indirectly positively influenced the implementation of self-management skills training. It was observed that individual education significantly increased and positively impacted the scores on the diabetes self-management scale, with significant improvements in all sub-dimensions except physical activity. This lack of improvement in physical activity may be influenced by social beliefs and perceptions, where pregnant women are expected to rest and reduce movement. Therefore, promoting physical activities that are safe and will not adversely affect pregnancy could be beneficial for broader acceptance among pregnant women. National studies on the benefits of physical activity during pregnancy and its positive effects on pregnancy and GDM management could play a crucial role in raising social awareness. Similar to individualized education programs, there is also a need for physical activity planning and studies to promote physical activity during pregnancy. Additionally, the study demonstrated that self-management education was significantly associated with lower birth weights. Follow-up studies during the postpartum period are needed to determine whether the effects of the intervention are long-lasting or specific to pregnancy, as adopting healthy lifestyle behaviors after pregnancy could help reduce the risk of developing type 2 diabetes. In conclusion, diabetes self-management education provided by midwives and nurses, who spend the most time with pregnant women, positively influenced diet, lifestyle changes, and the use of health care services, as well as having positive effects on perinatal outcomes.

Ethics

Ethics Committee Approval: Ethical approval for the study was obtained from the Ethics Committee of University of Health Sciences Türkiye, Başakşehir Çam and Sakura City Hospital (approval no.: 78, date: 31.01.2024), and the study was conducted in accordance with the Helsinki Declaration.

Informed Consent: The purpose and procedures of the study were verbally explained to all participants by the researchers. Data collection was completed after obtaining written informed consent from each participant.

Footnotes

Author Contributions

Concept: AÖ, FA; Design: AÖ, FA; Data Collection or Processing: AÖ, BAH; Analysis or Interpretation: AÖ, FA; Literature Search: AÖ, FA; Writing: AÖ, FA.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. American Diabetes Association. Classification and diagnosis of diabetes. Diabetes Care. 2016; 39(Suppl 1): S13-22. [Crossref]
2. Guo M, Shi WX, Parsons J, Forbes A, Kong M, Zhang YP, et al. The effects of a couple-based gestational diabetes mellitus intervention on self-management and pregnancy outcomes: a randomised controlled trial. Diabetes Res Clin Pract. 2023; 205: 110947. https://doi.org/10.1016/j.diabres.2023.110947. [Crossref]
3. Karavasileiadou S, Almegewly W, Alanazi A, Alyami H, Chatzimichailidou S. Self-management and self-efficacy of women with gestational diabetes mellitus: a systematic review. Glob Health Action. 2022; 15(1): 2087298. https://doi.org/ 10.1080/16549716.2022.2087298. [Crossref]
4. International Diabetes Federation. IDF Diabetes Atlas 10th Edition. Available at: https://diabetesatlas.org/idfawp/resourcefiles/2021/07/IDF_Atlas_10th_Edition_2021.pdf. 2021. [Crossref]
5. Su MC, Chang MY, Sun JC. Self-management experience of first-time diagnosed gestational diabetes mellitus: a focus group interview. Nurs Open. 2023; 10(3): 1744-54. https://doi.org/10.1002/nop2.1431. [Crossref]
6. Yang W, Liu J, Li J, Liu J, Liu H, Wang Y, et al. Interactive effects of prepregnancy overweight and gestational diabetes on macrosomia and large for gestational age: a population-based prospective cohort in Tianjin, China. Diabetes Res Clin Pract. 2019; 154: 82-9. [Crossref]
7. Parsons J, Sparrow K, Ismail K, Hunt K, Rogers H, Forbes A. A qualitative study exploring women's health behaviours after a pregnancy with gestational diabetes to inform the development of a diabetes prevention strategy. Diabet Med. 2019; 36(2): 203-13. [Crossref]
8. Rasmussen L, Poulsen CW, Kampmann U, Smedegaard SB, Ovesen PG, Fuglsang J. Diet and healthy lifestyle in the management of gestational diabetes mellitus. Nutrients. 2020; 12(10): 3050. [Crossref]
9. Kim SH, Kim HJ, Shin G. Self-management mobile virtual reality program for women with gestational diabetes. Int J Environ Res Public Health. 2021; 18(4): 1539. [Crossref]
10. Lee-Parritz A. Contemporary management of gestational diabetes. Curr Opin Endocrinol Diabetes Obes. 2011; 18(6): 395-400. [Crossref]
11. Lee KW, Ching SM, Ramachandran V, Yee A, Hoo FK, Chia YC, et al. Prevalence and risk factors of gestational diabetes mellitus in Asia: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2018; 18(1): 494. [Crossref]

12. Buchanan TA, Xiang AH, Page KA. Gestational diabetes mellitus: risks and management during and after pregnancy. Nat Rev Endocrinol. 2012; 8(11): 639-49. [Crossref]
13. Phummanee R, Limruangrong P, Phahuwattanakorn W. The influence of types of gestational diabetes mellitus, self-management, social support, and risk perception on health-related quality of life in pregnant women with gestational diabetes mellitus. Thai J Obstet Gynaecol. 2024; 32(2): 156-64. [Crossref]
14. Auntarin S, Tachasuksri T, Supasrimanont W. Factors influencing stress among women with gestational diabetes mellitus. The Journal of Faculty of Nursing Burapha University 2020; 28(1): 12-25. [Crossref]
15. Mohebbi B, Tol A, Sadeghi R, Mohtarami SF, Shamshiri A. Self-management intervention program based on the health belief model (HBM) among women with gestational diabetes mellitus: a quazi-experimental study. Arch Iran Med. 2019; 22(4): 168-73. [Crossref]
16. Haron Z, Sutan R, Zakaria R, Abdullah Mahdy Z. Self-care educational guide for mothers with gestational diabetes mellitus: a systematic review on identifying self-care domains, approaches, and their effectiveness. Belitung Nurs J. 2023; 9(1): 6-16. [Crossref]
17. Mathai E, Allegranzi B, Kilpatrick C, Pittet D. Prevention and control of healthcare-associated infections through improved hand hygiene. Indian J Med Microbiol. 2010; 28(2): 100-6. [Crossref]
18. Lefkovits YR, Stewart ZA, Murphy HR. Gestational diabetes. Medicine. 2019; 47(2): 114-8. https://doi.org/10.1016/j.mpmed.2018.11.006. [Crossref]
19. Rokni S, Rezaei Z, Noghabi AD, Sajjadi M, Mohammadpour A. 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. J Prev Med Hyg. 2022; 63(3): E442-7. [Crossref]
20. Xu N, Han X, Chen S, Zhang J, Gu P. Self-reported barriers in self-management of women with gestational diabetes: a systematic review of qualitative studies. Nurs Open. 2023; 10(11): 7130-43. [Crossref]
21. Eroğlu N, Sabuncu N. Adaptation of the Diabetes Self-Management Scale (DSMS) to the Turkish society: validity and reliability study. Journal of Nursing Science. 2018; 1(3): 1-6. [Crossref]
22. Evcili F, Dağlar G. Perception of Pregnancy Risk Scale: Turkish validity and reliability study. Cukurova Med J. 2019; 44: 211-22. [Crossref]
23. American Diabetes Association. 5. Lifestyle management: standards of medical care in diabetes-2019. Diabetes Care. 2019; 42(Suppl 1): S46-S60. [Crossref]
24. Kusumaningrum NSD, Asmara FY, Nurmalia D. Healthcare professionals' opinions regarding health coaching for patients with diabetes: a pilot exploration in Indonesia. Belitung Nurs J. 2022; 8(1): 67-74. [Crossref]
25. McClurg DP, Gissler M, Gatt M, Wallace J, Bhattacharya S. Does interpregnancy BMI change affect the risk of complications in the second pregnancy? Analysis of pooled data from Aberdeen, Finland and Malta. Int J Obes (Lond). 2022; 46(1): 178-85. [Crossref]
26. Yew TW, Chi C, Chan SY, van Dam RM, Whitton C, Lim CS, et al. A randomized controlled trial to evaluate the effects of a smartphone application-based lifestyle coaching program on gestational weight gain, glycemic control, and maternal and neonatal outcomes in women with gestational diabetes mellitus: the SMART-GDM study. Diabetes Care. 2021; 44(2): 456-63. [Crossref]
27. Zhang S, Liu H, Li N, Dong W, Li W, Wang L, et al. Relationship between gestational body mass index change and the risk of gestational diabetes mellitus: a community-based retrospective study of 41,845 pregnant women. BMC Pregnancy Childbirth. 2022; 22(1): 336. [Crossref]
28. Gabbe SG, Landon MB, Warren-Boulton E, Fradkin J. Promoting health after gestational diabetes: a National Diabetes Education Program call to action. Obstet Gynecol. 2012; 119(1): 171-6. [Crossref]
29. Zera CA, Nicklas JM, Levkoff SE, Seely EW. Diabetes risk perception in women with recent gestational diabetes: delivery to the postpartum visit. J Matern Fetal Neonatal Med. 2013; 26(7): 691-6. [Crossref]
30. He J, Chen X, Wang Y, Liu Y, Bai J. The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence. Rev Endocr Metab Disord. 2021; 22(4): 777-87. [Crossref]
31. Suwanpakdee W, Buddam M, Lahukarn B. The relationship between risk perception and stress towards exercise behavior of pregnant women with gestational diabetes mellitus. Princess of Naradhiwas University Journal. 2024; 16(2): 177-91. [Crossref]
32. Sangin S, Phonkusol C. Perception of pregnancy risk and related obstetric factors among women of advanced maternal age. Pacific Rim Int J Nurs Res. 2021; 25(3): 494-504. [Crossref]
33. Akalpler O, Bagriacik E. Education programs for gestational diabetes mellitus: a systematic review. Human Nutrition and Metabolism. 2023: 33; 200195. [Crossref]
34. Kytö M, Koivusalo S, Ruonala A, Strömberg L, Tuomonen H, Heinonen S, et al. Behavior change app for self-management of gestational diabetes: design and evaluation of desirable features. JMIR Hum Factors. 2022; 9(4): e36987. [Crossref]
35. Mishra S, Kishore S. Effect of physical activity during pregnancy on gestational diabetes mellitus. Indian J Endocrinol Metab. 2018; 22(5): 661-71. [Crossref]
36. Nascimento SL, Surita FG, Cecatti JG. Physical exercise during pregnancy: a systematic review. Curr Opin Obstet Gynecol. 2012; 24(6): 387-94. [Crossref]