

Assessing the effectiveness of an educational program for patients with gestational diabetes in Assiut University

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Objective

The aim was to evaluate the effectiveness of an individualized educational program in improving patient's awareness, knowledge, and attitude and to assess its role in reducing the burden of gestational diabetes mellitus (GDM).

Patients and methods

A prospective study was conducted on women diagnosed to have GDM at 24–28 weeks of gestation according to The Diabetes In Pregnancy Study group India criteria 2015 (2h blood glucose ≥ 140 mg/dl) between December 2015 and December 2016 who were enrolled into an individualized GDM educational program. A modified and shortened version of a validated questionnaire developed by Carolan and colleagues was tested before and after education to evaluate the feedback of education. Follow-up was every 2 weeks till labor to assess awareness together with both maternal and fetal outcomes.

Results

A total of 60 pregnant women diagnosed to have GDM were included. The questions that were answered correctly in the post-test by more than 50% of the participants fell into these categories: definition of GDM (100%), associated risk factors (75%), way of diagnosis (83.3%), management of GDM (71.7%), and postpartum follow-up (56.7%). As regards fetal and maternal outcome it was observed that both weight gain and glycemic control were better in the well-educated group versus other groups ($P=0.02$, 0.01 , respectively).

Conclusion

Health education plays an important role in increasing patients awareness regarding the GDM risk and its proper management in order to reduce its complications both for the mother and the fetus.

Keywords:

educational program, fetal and maternal outcome, gestational diabetes, questionnaire

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Introduction

Gestational diabetes mellitus (GDM) is a type of diabetes that affects pregnant women during the second and third trimester due to insulin resistance that has resulted from hormone production by the placenta [1]. It has been estimated that 75–90% of cases of high blood glucose during pregnancy are GDM [2]. An oral glucose tolerance test is recommended for screening of GDM between the 24th and 28th week of pregnancy, but for high-risk women the screening should be conducted earlier in pregnancy [3]. A major part of GDM management involves educating patients about diet, exercise, self-monitoring, and insulin treatment to decrease its morbidity and mortality [4].

Patients and methods

The study design was a prospective cohort study that included 60 pregnant women diagnosed to have GDM according to The Diabetes In Pregnancy Study group India criteria 2015 (2 h blood glucose ≥ 140 mg/dl) [5]

as a result of screening of 600 pregnant women between December 2015 and December 2016.

Inclusion criteria

Pregnant women diagnosed to have GDM between 24 and 28 weeks of gestation according to The Diabetes in Pregnancy Study group India guidelines 2015 by 2 h blood glucose level equal to or more than 140 mg/dl after loading with 75 g glucose [5].

Exclusion criteria

Diabetic pregnant women diagnosed with a history or 2 h blood glucose level after ingestion of 75 g glucose greater than or equal to 200 mg/dl and HbA1c greater than or equal to 6.5%.

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After clinical and laboratory diagnoses of GDM, the patients were subjected to complete history and clinical examination with concern on blood pressure and body weight. Abdominal sonar was done if indicated under supervision of an obstetrician.

Before education the patients were tested by a modified and shortened version of a validated questionnaire developed by Carolan *et al.* [6], which was translated into Arabic. Then it was repeated again after education to evaluate the feedback of education. Questions addressed the medical risk, management, outcome of GDM, and postpartum follow-up as well as nutritional and exercise benefits.

Those women were enrolled in the GDM educational program. Topics covered during the educational session were pertinent to identifying GDM risks, managing GDM during pregnancy and at postpartum follow-up. The patient was encouraged through the program to apply certain rules during pregnancy to control blood glucose level and to decrease complications to herself and her baby alike:

- (1) Healthy eating [7,8] and physical activity [9].
- (2) Monitoring blood glucose levels: testing blood glucose levels at least three times daily and recorded in a structured table.
- (3) Medication: after 2 weeks of lifestyle modification if blood glucose level did not reach target a level which is:
 - (a) Fasting blood glucose level is less than 90 mg/dl.
 - (b) 1 h postprandial blood glucose level is less than 130 mg/dl.
 - (c) 2 h postprandial blood glucose level is less than 120 mg/dl.

Insulin therapy is initiated and titrated according to patient requirements to reach the target level.

Educational materials like the plate method meal plan, brochures, illustrations, and animation video were used to enhance patient skills.

The educational sitting is individualized for every patient and then the patients were asked the same question to evaluate the feedback of education. The patients then were categorized into three groups: poorly, moderately, and well-educated group according to their GDM post-test knowledge score. Follow-up was every 2 weeks till labor with monitoring of blood pressure and body weight. The patients were also subjected to the following investigations:

- (1) Blood glucose measurement.

- (2) Abdominal sonar.
- (3) Mean blood glucose values were calculated over periods of at least 30 days. An average of three glucose measurements per day was recorded.

Study outcome

Primary outcome

To raise patients awareness, knowledge, attitude, and practice regarding GDM management and outcome.

Secondary outcome

To prevent short-term fetal and maternal complications.

Ethics and consents

It was approved by the Faculty's Ethics Committee and permission was obtained from the ethics committee to assure confidentiality. A background about this study and its reason were explained, and the targeted population was encouraged to participate without any undue pressure, and consent was taken from each participant.

Statistical analysis

The collected data were entered, and edited using SPSS version 20 statistical software (IBM Corp., Released 2011, IBM SPSS Statistics for Windows, Version 20.0.< IBM Corp., Armonk, NY) software Chicago. Descriptive statistics of the collected data was done for most variables in the study using statistical measurements. Frequency tables, graphs, percentages, mean, and SD were used.

Results

A total of 60 pregnant women diagnosed to have GDM were included (from 600 pregnant women screened for GDM, with an incidence rate of 10%), with a mean age of 28±5 years, mean age of marriage 24±8 years, and parity of 4±2 times (Table 1).

Two (3.33%) women had a previous history of GDM, eight (13.33%) women had previous macrosomic babies, and 20 (33.33%) women had first-degree relatives with

Table 1 Baseline characteristics of women with gestational diabetes mellitus

Variables	Mean±SD
Age (years)	28±5
Age of marriage (years)	24±8
Parity (frequency)	4±2
BMI (kg/m ²)	28.4±5.3
Systolic blood pressure (mmHg)	125±10
Diastolic blood pressure (mmHg)	70±10
Gestational age (weeks)	25±4
Diagnosis of gestational DM (weeks)	26±4

DM, diabetes mellitus.

diabetes mellitus (DM), which was considered as independent risk factor for GDM (Fig. 1).

Most of the questions were answered correctly in the post-test by more than 50% of the participants who fell into these categories: definition of GDM (100%), associated risk factors (75%), ways of diagnosis (83.3%), management (71.7%), and consequences to the baby (78.3%) (Table 2).

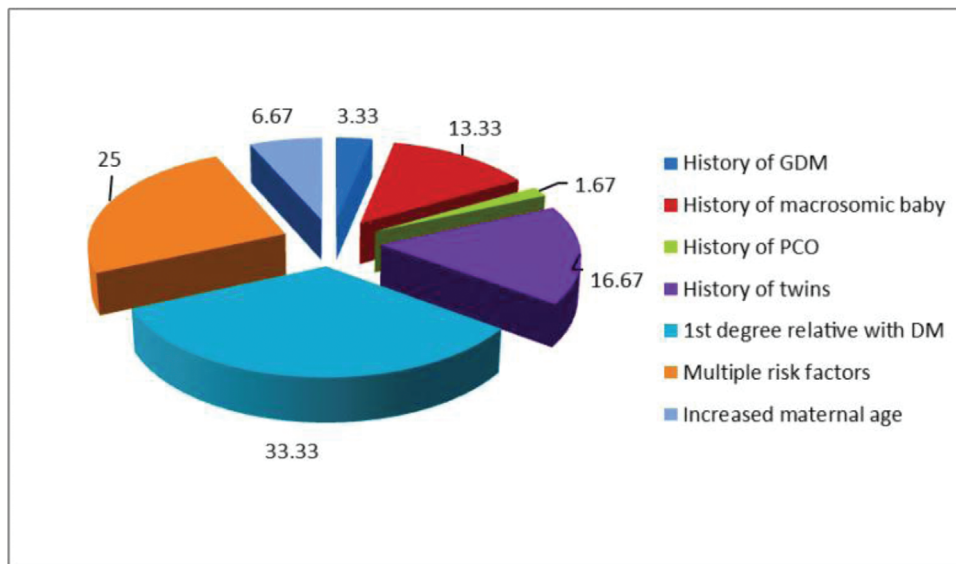
Blood glucose was controlled by medical nutritional therapy and exercise in 37 (61.7%) women of whom 19 (76%) was well-educated women; the rest 23 (38.3%) women needed insulin therapy. As regards fetal and maternal outcome it was observed that both weight

gain and glycemic control were better in the well-educated group versus other groups ($P=0.02, 0.01$, respectively). Six (10%) women had macrosomic baby and two-thirds of them was in the poorly educated group. Other abnormalities like fetal malformations and stillbirth were not observed (Table 3).

Discussion

This study was part of the project of GDM care in Upper Egypt (WDF 13–797) under the supervision of world diabetes foundation (WDF), which aims to screen and to detect early cases with GDM to decrease its morbidity for both the mother and the fetus. At the beginning of

Figure 1



Risk factors of gestational diabetes mellitus.

Table 2 Results of gestational diabetes mellitus questionnaire before and after education

	Before education [n (%)]		After education [n (%)]		P. value
	Correct	Incorrect	Correct	Incorrect	
Definition of gestational diabetes	40 (66.7)	20 (33.3)	60 (100.0)	0 (0.0)	<0.001**
Risk factors for gestational diabetes	15 (25.0)	45 (75.0)	45 (75.0)	15 (25.0)	<0.001**
Diagnosis of gestational diabetes	15 (25.0)	45 (75.0)	50 (83.3)	10 (16.7)	<0.001**
Consequences to women	16 (26.7)	44 (73.3)	41 (68.3)	19 (31.7)	<0.001**
Foods not allowed to eat	4 (6.7)	56 (93.3)	47 (78.3)	13 (21.7)	<0.001**
Impact of unhealthy diet	35 (58.3)	25 (41.7)	38 (63.3)	22 (36.7)	0.575
Hazards of large carbohydrate meal	45 (75.0)	15 (25.0)	55 (91.7)	5 (8.3)	0.014*
What to do if blood sugar is constantly high	7 (11.7)	53 (88.3)	44 (73.3)	16 (26.7)	<0.001**
Causes of hypoglycemia	45 (75.0)	15 (25.0)	55 (91.7)	5 (8.3)	0.014*
Treatment of hypoglycemia	32 (53.3)	28 (46.7)	39 (65.0)	21 (35.0)	0.193
Effect of walking on GDM	23 (38.3)	37 (61.7)	46 (76.7)	14 (23.3)	<0.001**
Management of gestational diabetes	0 (0.0)	60 (100)	43 (71.7)	17 (28.3)	<0.001**
Complications of gestational diabetes	17 (28.3)	43 (71.7)	35 (58.3)	25 (41.7)	0.001**
Consequences to baby	4 (6.7)	56 (93.3)	47 (78.3)	13 (21.7)	<0.001**
Follow-up glucose test after delivery	12 (20.0)	48 (80.0)	34 (56.7)	26 (43.3)	<0.001**

GDM, gestational diabetes mellitus. *Means significance. **Means highly significant.

Table 3 Fetal and maternal outcome for women with gestational diabetes mellitus

Variables	Poorly educated (n=15) [n (%)]	Moderately educated (n=20) [n (%)]	Well educated (n=25) [n (%)]	Total (n=60) [n (%)]	P value
Fetal outcome					
No abnormality	13 (86.67)	17 (85)	20 (80)	50 (83.33)	0.09
Macrosomia	4 (26.7)	2 (10)	0	6 (10)	0.03
Hypoglycemia	2 (13.3)	1 (5)	0	3 (5)	0.21
Malformation	0	0	0	0	0.06
Stillbirth	0	0	0	0	
Respiratory stress	3 (20)	4 (10)	2 (8)	9 (15)	
Time of delivery					
Full term	9 (60)	11 (55)	14 (56)	34 (56.67)	0.06
Preterm	6 (40)	9 (45)	11 (44)	26 (43.33)	
Type of delivery					
Vaginal	7 (46.67)	10 (50)	15 (60)	32 (53.3)	0.21
CS	8 (53.33)	10 (50)	10 (40)	28 (46.7)	
Maternal outcome					
Pre-eclampsia	2 (13.33)	2(10)	0	4 (6.67)	0.09
Weight gain	3 (20)	1 (5)	1 (4)	5 (8.33)	0.02
Shoulder dystocia	0	2 (10)	0	2 (3.33)	0.11
Hydramnios	4 (26.67)	2 (10)	1 (4)	7 (11.67)	0.02
Mean blood glucose	184.6±22.3	167.3±18.4	124.6±13.9	146.3±29.7	0.01
No abnormality	6 (40)	15 (75)	19 (76)	40 (66.67)	0.78

CS, cesarean section.

the study, we examined more than 600 pregnant women for the presence of GDM, and we discovered 60 (10%) women to have GDM. When comparing the prevalence of GDM observed in our locality with other different localities, it was close to that reported in a previous study in Western India which estimated a 9.5% prevalence of GDM [10], whereas it was less than that reported from other Indian regions such as Punjab (35%) [11] and Lucknow (41%) [12]. Also Saudi Arabia reported a higher prevalence rate of about 24% [13,14]. On the other side, both Oman and Qatar reported a lower prevalence rate of 4.2 and 6.4%, respectively [15,16]. The reported variations in the prevalence rates of GDM could be attributed to multiple factors, such as the use of different criteria of diagnosis, and the established relationship between ethnicity and epidemiology of GDM. As ethnicity has many health impact, including lifestyle factors, such as diet and physical activity, social and economic situation, and feasibility of medical care and geographical patterns of genetic inheritance [17,18]. As regards the risk factors for GDM, we found that a positive family history for type 2 DM was considered the strongest predictor and was an independent risk factor for developing GDM. This was in accordance with several cross-sectional and prospective studies as a family history of diabetes was a highly significant risk for developing GDM [19,20]. Other previous studies reported that previous GDM and age more than 35 years were more associated with GDM than the other risk factors [21,22]. In our study, we implemented an educational

program for women diagnosed to have GDM aiming to increase their knowledge, awareness, and attitude toward the disease in order to decrease its burden for both the mother and the fetus. We preferred to apply individual educational setting than group education, as most of the study participants were fairly educated, had no past experience to deal with this kind of disease, and to establish individual treatment approach. As we considered group education is more beneficial in people with diabetes than with GDM as people with DM had past experience to deal with this disease, it also enables them to share their experience regarding disease management, also increasing their motivational skills to prevent its complication. Also we observed that all participant women showed improvement in their knowledge about their disease, complication, and proper diet and insulin therapy. This was also observed in a previous pilot study, which concluded that educational intervention significantly increases diabetes knowledge in women with GDM [23]. These findings suggest the need for aggressive educational strategies for women with GDM and in high-risk groups of young women. We categorized the participants according to their post-test score into poorly educated less than 60%, moderately educated 60 to less than or equal to 75%, and well educated greater than 75%, we supposed this categorization of the participants to correlate the impact of GDM with their level of education. Carolan-O'Leah [24] had reviewed 12 papers about the efficacy of GDM education in reducing its burden, although

interventions had a different approach, most were successful in reducing insulin requirements, rates of macrosomia and hypertensive disorders, and in improving the levels of knowledge and pregnancy outcomes. Only one study found that the intervention did not contribute any positive outcome [6]. This was in accordance with our study, as most of the enrolled GDM women were controlled with medical nutritional therapy and only 38.3% needs insulin. Also the mean blood glucose was significantly optimized in the well-educated group versus other groups. As regards fetal and maternal outcomes, no cases of macrosomia and fetal hypoglycemia were detected in the well-educated group versus other groups. This was in accordance with a previous study which reported a higher percentage of macrosomia in women with low educational level [25]. Also fetal malformations and stillbirth were not detected in all the study groups. We also observed that the well-educated group had significantly less weight gain and less incidence of pre-eclampsia and hydramnios. On the other hand, no statistically significant difference regarding the rate of cesarean section was observed in between groups, this may be attributed to the preference of some obstetricians to deliver by cesarean section without apparent indication. All of these findings reflect the importance of health education in GDM as it not only improves patient knowledge and awareness but also reduces short-term GDM burden.

Conclusion

Health education plays an important role in increasing the awareness of pregnant women regarding GDM risk and its proper management in order to reduce its burden both for the mother and the fetus, as we face a higher prevalence of GDM in our locality. Individualization of education is very essential as it increased the patients' ability to understand each topic and to easily communicate with the educator especially that most of the included patients were rural and fairly educated an also to counsel each woman with GDM about her own risk and the need for preventive measures.

Recommendations

- (1) Universal screening to all pregnant women to pick up early cases of GDM to reduce its burden.
- (2) Implementation of simple and clarified-GDM educational program to all pregnant women to increase their awareness.

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Nil.

Conflicts of interests

There are no conflicts of interest.

References

- 1 World Health Organization. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. Geneva, Switzerland: World Health Organization; 2013.
- 2 Guariguata L, Linnenkamp U, Beagley J, Whiting DR, Cho NH. Global estimates of the prevalence of hyperglycaemia in pregnancy. *Diabetes Res Clin Pract* 2014; 103:176–185.
- 3 American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care* 2003; 25:s5–s20.
- 4 International Diabetes Federation. St Vincent Declaration. 2004. Available at: <http://www.idf.org/e-atlas/home/index.cfm>
- 5 Seshiah V, Das AK, Balaji V, Joshi SR, Parikh MN, Gupta S. For Diabetes In Pregnancy Study Group (DIPSI). Gestational diabetes mellitus – guidelines. *JAPI* 2006; 54.
- 6 Carolan M, Steele C, Margetts H. Attitudes towards gestational diabetes among a multiethnic cohort in Australia. *J Clinical Nurs* 2010; 19:2446–2453.
- 7 American Dietetic Association. Medical Nutrition Therapy Evidence-Based Guides for Practice: Nutrition Practice Guidelines for Gestational Diabetes Mellitus (CD ROM). Chicago, IL: American Dietetic Association; 2001.
- 8 Institute of Medicine. Dietary Reference Intakes: Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: National Academies Press 2002.
- 9 Artal R, Catanzaro RB, Gavard JA, Mostello DJ, Friganza JC. A lifestyle intervention of weight-gain restriction: diet and exercise in obese women with gestational diabetes mellitus. *Appl Physiol Nutr Metab* 2007; 32: 596–601.
- 10 Bhatt AA, Dhore PB, Purandare VB, Sayyad MG, Mandal MK, Unnikrishnan AG. Gestational diabetes mellitus in rural population of Western India – results of a community survey. *Indian J Endocrinol Metab* 2015; 19: 507–510.
- 11 Arora GP, Thaman RG, Prasad RB, Almgren P, Brøns C, Groop LC *et al.* Prevalence and risk factors of gestational diabetes in Punjab, North India: results from a population screening program. *Eur J Endocrinol* 2015; 173:257–267.
- 12 Gopalakrishnan V, Singh R, Pradeep Y, Kapoor D, Rani AK, Pradhan S, *et al.* Evaluation of the prevalence of gestational diabetes mellitus in North Indians using the International Association of Diabetes and Pregnancy Study groups (IADPSG) criteria. *J Postgrad Med* 2015; 61:155–158.
- 13 Wahabi HA, Esmail SA, Fayed A, Alzeidan RA. Gestational diabetes mellitus: maternal and perinatal outcomes in King Khalid University Hospital, Saudi Arabia. *J Egypt Public Health Assoc* 2013; 88: 104–108.
- 14 Al-Rubeaan K, Al-Manaa HA, Khoja TA, *et al.* A community-based survey for different abnormal glucose metabolism among pregnant women in a random household study (SAUDI-DM). *BMJ Open* 2014; 4:e005906.
- 15 Barakat MN, Youssef RM, Al-Lawati JA. Pregnancy outcomes of diabetic women: charting Oman's progress towards the goal of the SaintVincent declaration. *Ann Saudi Med* 2010; 30:265–270.

- 16 Al-Kuwari MG, Al-Kubaisi SB. Prevalence and predictors of gestational diabetes in Qatar. *Diabetol Croat* 2011; 40:65–70.
- 17 Savitz DA, Janevic TM, Engel SM, Kaufman JS, Herring AH. Ethnicity and gestational diabetes in New York City, 1995–2003. *BJOG* 2008; 115:969–978.
- 18 Hunt KJ, Marlow NM, Gebregziabher M, Ellerbe CN, Mauldin J, Mayorga ME, Korte JE. Impact of maternal diabetes on birthweight is greater in non-Hispanic blacks than in non-Hispanic whites. *Diabetologia* 2012; 55:971–980.
- 19 Hossein-Nezhad A, Maghbooli Z, Vassigh AR, Larijani B. Prevalence of gestational diabetes mellitus and pregnancy outcomes in Iranian women. *Taiwan J Obstet Gynecol* 2007; 46:236–241.
- 20 Bhat M, Ramesha KN, Sarma SP, Menon S, Sowmini CV, Ganesh KS. Determinants of gestational diabetes mellitus: a case control study in a district tertiary care hospital in south India. *Int J Diabetes Dev Ctries* 2010; 30:91–96.
- 21 Bener A, Saleh NM, Al-Hamaq A. Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: global comparisons. *Int J Womens Health* 2011; 3: 367–373.
- 22 Ostlund I, Hanson U. Occurrence of gestational diabetes mellitus and the value of different screening indicators for the oral glucose tolerance test. *Acta Obstet Gynecol Scand* 2003; 82:103–108.
- 23 Amason JS, Lee S-Y., Aduddell K, Hewell SW, Brackley LV. Pilot feasibility study of an educational intervention in women with gestational diabetes. *J Obstet Gynecol Neonatal Nurs* 2016; 45:515–527.
- 24 Carolan-Olah MC. Educational and intervention programmes for gestational diabetes mellitus (GDM) management: an integrative review. *Collegian* 2016; 23:103–114.
- 25 Chung JH, Voss KJ, Caughey AB, Wing DA, Henderson EJ, Major CA. Role of patient education level in predicting macrosomia among women with gestational diabetes mellitus. *J Perinatol* 2006; 26:328–332.