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Educational program for Health Literacy among Pregnant Women with Gestational Diabetes: its effect on Maternal & fetal outcomes

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Abstract: Background: Gestational diabetes mellitus (GDM.) it has unfolded as a global public health problem. as well as the major part of (GDM.) management including educated pregnant women about diet, exercise, self-managements and monitoring of insulin to get better outcomes for the maternal and fetal health. the recent guidelines reported that knowledge and commitment level of health-care providers help for recuperation so must be recognized need for the advancement of health resources by educate and encourage women to self-manage their GDM. **The aim** of this study was to assess the effect of educational program for health literacy knowledge level of pregnant women with Gestational diabetes on Maternal & fetal outcomes. ***Methods***: This A prospective, quasi-experimental design that are affiliated to Women's Health University Hospital at Assiut city (Upper Egypt), on 50 pregnant women with (GDM.) between 28-36 gestational weeks who were interviewed for assessment of their knowledge and participate in the education program, two **tools** were used in this study, namely Pre-test and post-test knowledge questionnaire as well as educational program booklet. ***Results***: The most of women in the present study were aged from (20 < 30) years old, the common were presence of first-degree relatives with diabetes mellitus in 22(44%) women followed by presence of multiple risk factors in12(24%), The difference in levels of pre and post-test knowledge before and after education score resulted in significant improvement (p<0.001). The used of educational program resulted in significant improvement (P. value <0.001) of max score of knowledge before and after education after receiving program. while found no significant statistical difference between moderately and well-educated studied women for maternal and fetal outcomes. ***Conclusions***: The educational intervention in the present study, was significantly effective on knowledge and attitude of pregnant women with gestational diabetes.

Key words: Gestational diabetes mellitus (GDM), Health Literacy, Educational program, Maternal & fetal outcomes.

INTRODUCTION

Gestational diabetes mellitus (GDM) is described as a glucose intolerance which is first diagnosed in pregnancy**(Kleinwechter, et al.,2014)**.It is diagnosed in second and third trimesters of pregnancy, it has emerged as a global public health problem even though symptomatic in its specialized medical course, an oral glucose tolerance test is recommended for screening of GDM between the 24th and 28th week of pregnancy, but for high risk pregnancy the screening should be conducted earlier in pregnancy. A major part of GDM management involves educating pregnant women about diet, exercise, self-managements and monitoring of insulin to improve the maternal and fetal outcomes El Tony et al., 2018. In the long term, the risk of developing manifest type 2 diabetes (T2D) is significantly increased in women with GDM in the years following preliminary diagnosis **(Cavanaugh,2011).** The difficulties arising anticipated to GDM affect both the mother and the baby **(Holmes,etal.,2014).** The seriousness of GDM and the significantly increasing prevalence of this condition make it one of the most urgent health problems of this century, maternal and child health holding high public health relevance since long, community-level delivery of services still persists to be at high risk of fragmentation and inefficiency so it truly is important to raise public awareness of this condition and also to ameliorate the harmful effects of GDM once diagnosed **(Mishra,et al.,2018).** Majority of GDM subjects can be managed within the community. However, real success of these recent guidelines depends on knowledge and commitment level of health-care providers. Role of primary care physicians, along with primary health-care teams, for achieving universal GDM identification in community, ensuring adequate management, and prompt referral to higher centers is of paramount importance. In addition, their responsibility to ensure compliance and health education interventions will help improving outcomes **(Guariguata, et al.,2014).** Unfortunately, due to insufficient give attention to prevention and lack of preconception planning, several challenges pertaining to maternal healthcare still continue to be Insufficient of access to attention and financial issues are some barriers to utilization of healthcare **(Kleinwechter, et al.,2014).** In addition, health literacy is also becoming a growing and relevant factor which has been shown to lower the risk of unfavorable outcomes in non-pregnant women **(Holmes, et al.,2014)**. Improving health literacy helps the specific to understand and adopt a healthy lifestyle. The concern, however, is that handling of GDM requires women to come to terms with their diagnosis in a brief period of time, there is limited evidence of successful intervention studies for women with GDM For the same time, the value of GDM self-management is discussed in the literature, in conditions of improving glycemic control and in addition to reducing obesity and pregnancy problems**(Cheung, 2009; Glastras & Fulcher, 2012).** Additionally, there is also a recognized need for the advancement of health resources to educate, encourage women to self-manage their GDM **(Carolan-Olah,2016)**

Significance of the study:

During the past decade, the prevalence of gestational diabetes mellitus (GDM) has been increasing worldwide. In 2015 alone, it was estimated that 20. 9 million women experienced hyperglycemia in pregnancy, eighty-five % of which were due to GDM

Objectives:

1. Assessment of studied women regarding‟ knowledge of gestational diabetes (before education)
2. Implementing the structured Educational program regarding gestational diabetes
3. Assessment of the improving of pregnant women‟ knowledge one month later (after education)
4. Comparing between knowledge of studied pregnant women before and after education-test

Research hypothesis:

After educational program, ignorance of gestational diabetes will be eliminated and women knowledge about it will be improved.

METHODS

Research design: A prospective, quasi-experimental design was used to measure the effectiveness of structured education program on studied women knowledge with gestational diabetes.

Setting: The study was conducted from June to December 2018 at Women's Health Hospital Assiut University in Asyut governorate (Upper Egypt). The women's health facility is providing all types of women's healthcare.

Sample size: The total sample size was 50 respondents were enrolled voluntarily in the study at outpatient clinic in Assuit University Hospital with clinical diagnosis of gestational diabetes.

Inclusion Criteria: The study including all pregnant woman with gestational diabetes between 28-36 gestational weeks who gave consent to participate in the education program.

Exclusion Criteria:

- The pregnant women with gestational diabetes who participated before in education programs.
- Diabetic pregnant women

Study tools: Two tools were used in this study, namely Pre-test and post-test knowledge questionnaire as well as educational program booklet.

Tool (I): Knowledge assessment questionnaire sheet: This tool aimed to assess the pregnant women' knowledge about gestational DM. It consisted of 15 questions (multiple choices questions) It entailed of four parts:

- ***Part I:*** It included the personal data of the pregnant woman with gestational diabetes, name, age education level and telephone number
- ***Part II:*** It included medical data, blood pressure, body mass index and family history
- ***Part III:*** It included mother multiple risk factor as age ≥ 35, first degree relative with DM, History of twins, History of PCO, History of microcosmic baby and History of GDM
- ***Part IV:*** it included many questionnaires related to gestational diabetes & it's managements

Scoring system: Only one is correct or best answer related to her knowledge about gestational diabetes.

- The correct answer ="1",
- while the incorrect= "zero".

The total score calculated from 15 degrees (total questions) The answers score was rated as **well**, **moderate** and **poor knowledge** according to its total score and classified into:

- Poor educated for women had less than **5** correct answers,
- moderate educated for women had **5-10** correct answers
- well educated for women had more than **10** correct answers.
- The data collection took from 25 to 35 minutes for each patient separately
- Content validity of the used tools was done by a jury of (5) specialists in the field of medical- surgical and obstetric & Gynecological nursing department to determine whether the included items clearly and adequately cover the domain of content addressed
- The reliability was tested for tool (I) (knowledge interview questionnaire sheet) by using Cranach's alpha coefficient.

Tool (II): the educational program booklet: It was designed by the researchers based on patient's needs evaluation, literature review, researcher experience and opinions of the medical and obstetric & Gynecological nursing expertise. The researchers adapted concluded with a few modifications then translated into Arabic by the assistance of English teachers. It included the following items:

- Knowledge about gestational diabetes,
- activities and healthy diet.

Pilot study: A pilot study was conducted to test the applicability of the tools, and to estimate the time needed. It was carried out on 5 pregnant women with gestational diabetes. The results of the pilot study helped in refining the pre-test questionnaire for any modifications to be easily understood and answered quickly

Ethical consideration: The study was approved by Women's Health Hospital and faculty of Nursing Ethics Committees. The aim of the study was explained clearly for all participants and they gave an informed consent before interviews were conducted. All other ethical issues such as maintaining confidentiality and avoiding harm were strictly observed during the study

Procedure/Data collection:

- Data was collected by the author from June to December 2018 where the author calculated height and weight, BMI, and expected date of delivery
- Then asked those pregnant women 15 questions about their knowledge related to gestational diabetes (diagnosis, management, effect of activity as walking

on glucose level, complications on mother and fetus and follow up after delivery) **(tool I)**

- Pre-test evaluation: The author educated these women about gestational diabetes, activities and healthy diet by using a Power-point and also the author gave the all women booklet**. (Tool II)**
- The training program was conducted at diabetic clinic at Women's Health Hospital.
- Post-test evaluation: After four weeks the evaluate the studied women knowledge after education, the data collected by using the same questionnaire which used before education**. (tool I)**

Statistical analysis: For data analysis, SPSS Version 20.0 statistical software packages were used. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and cross tabulation variables. Test of significance was used and level of statistical significance is $P < 0.05$.

RESULT

Table1: General characteristics of studied women(n=50)

Variables		**No**	**%**
Age(year)			
20<30		25	50%
30<40		21	42%
40		4	8%
	27.5±5.4		
Level of education			
Primary		6	12%
Secondary		30	60%
University		14	28%
Parity			
< 2		16	32%
2<4		32	64%
4±		2	4%
BMI (kg/m ^{2})			
<18.5 (underweight)		5	10%
≥18.5-<25 (normal)		15	30%
≥25-<35 (overweight)		30	60%
Family history of DM			
Yes		36	72%
No		14	28%
Blood pressure(mm/Hg)			
Hypotension (Less than110/70)		6	12%
Hypertension (More than140/80)		44	88%

Data was expressed in form of frequency(percentage)

Table1: shows that general characteristics of the pregnant woman including age, level of education, Parity, BMI, Family history of DM and Blood pressure where the most of studied women were aged from 20 to less than 30 years old, and parity 2 to 4 overweight, they were suffered from hypertension and had family history of diabetes mellitus

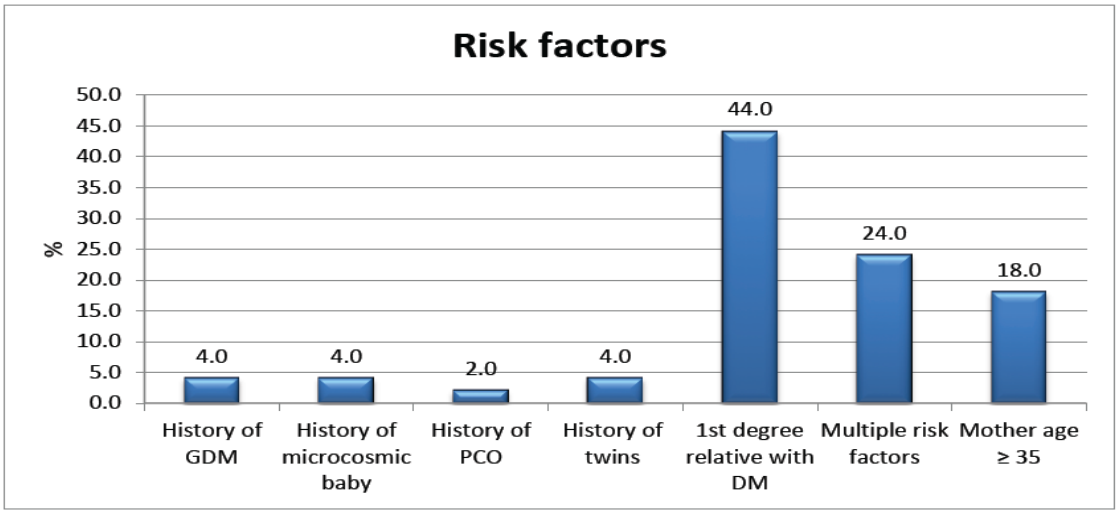

Fig.1 Frequency of risk for gestational DM

Fig.1: represented that risk factors where the common was presence of first-degree relatives with diabetes mellitus in 22(44%) women followed by presence of multiple risk factors in12(24%).

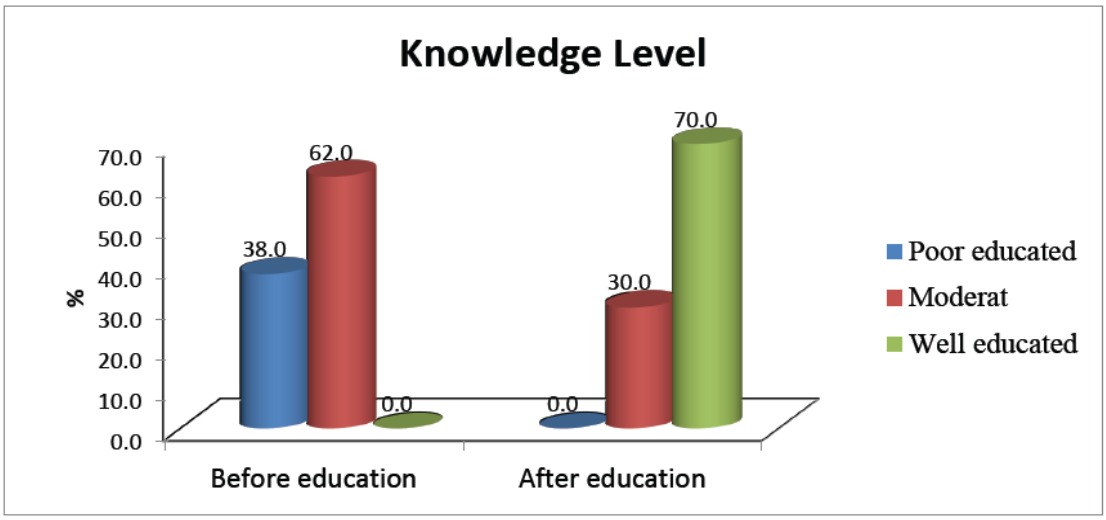

Figure 2. The difference in levels of pre and post-test knowledge

Fig.2: shows the comparison between of knowledge before and after education score and data reflected statistical significance after receiving program at (P. value <0.001).

Table 2: Women knowledge about gestational DM before and After educational program

Items	Before (n=50)	After (n=50)	p value
Gestational diabetes will be diagnosed if:			
1. The level of glucose is ≥ 140mg\dl after taking 75gm glucose	37(74%)	47 (94%)	
2. Glucose is presence in urine	8(16%)	3(6%)	0.037*
3. The level of blood glucose is ≤100mg\dl	3 (6%)	0(0%)	
4. I do not know	2(4%)	0 (0.0%)	
Gestational diabetes is			
1. occurred during pregnancy and continue after delivery	3 (6%)	0(0%)	
2. occurred during pregnancy and end after Delivery	7(14%)	43(86%)	
3. occurred before pregnancy and continue after delivery	38(76%)	4(8%)	<0.001**
4. I don't know	2(4%)	3(6%)	
The pregnant women is at risk of gestational diabetes if:			
1. *There is family history of diabetes	9(18%)	5(10%)	
2. Previous history of gestational diabetes Mellitus	12 (24%)	6(12%)	0.002**
3. Obesity	10 (20%)	2(4%)	
4. All the above	19 (38%)	37(74%)	

Chi-square test, * Significant difference at p. value<0.05, ** Significant difference at p. value<0.01

Tables2: Shows that women knowledge about gestational diabetes mellitus. As regards diagnosed of diabetes mellitus where37(74%) and47 (94%) women before and after education respectively correctly answered that the level of glucose is ≥ 140mg\ dI after taking 75gm glucose. with statistically significant difference between knowledge before and after education where P value was 0.037. As regarding, occurrence of gestational diabetes and if continue or not, 7(14%) and43(86%) women before and after education respectively correctly answered that occurred during pregnancy and end after delivery. with statistically significant difference between knowledge before and after education where P value was0.001**. As regards the pregnant women is at risk of gestational diabetes. Where19 (38%) and 37(74%) women before and after education respectively correctly answered that All the items were with statistically significant difference between knowledge before and after education where P value was (0.002**)

Table 3: Knowledge of studied women about life style for management of gestational diabetes mellitus before and after education

Items	Before N(50)	After N(50)	P value
Walking during pregnancy may lead to:			
1. Increase in blood glucose level	7(14%)	4(8%)	<0.001**
2. Increase in desire to eating more	15(30%)	4(8%)	
3. Decrease in blood glucose level	23(46%)	42(76%)	
4. I do not know	5(10%)	0(0%)	
Pregnant woman with gestational diabetes should avoid the following substances:			
1. Eating much fat	12(24%)	3(6%)	<0.001**
2. Eating much carbohydrates	10(20%)	1(2%)	
3. Eating sweet substance	20(40%)	7(14%)	
4. All of the above	8(16%)	39(78%)	
Eating large amount of carbohydrates such as rice/ pasta may lead to			
1. Decrease of blood glucose level	3(6%)	0(0%)	0.190
2. Increase of blood glucose level	38(76%)	45(90)	
3. No effect on blood glucose level	5(10%)	3(6%)	
4. I do not know	4(8%)	2(4%)	

Chi-square test, ** Significant difference at p. value<0.01

Table 3: Shows the comparison between before and after education related to Knowledge of studied women about life style for management of gestational diabetes mellitus. As regards effect of walking on blood glucose level while23(46%) and42(76%) before and after education respectively correctly answered that decrease in blood glucose level. with statistically significant difference where P value was 0.001**. Regarding to food avoided while8(16%) and 39(78%) before and after education respectively correctly answered that all of the items should avoided. With statistically significant difference where P value was (0.001**). The commonest was increase of blood glucose level that was the correct answer in38(76%) and45(90) before and after education respectively where p value was 0.190.

Table 4: Knowledge of studied women about management of gestational diabetes mellitus in some condition before and after educational program

Items	Before (n=50)	After (n=50)	P value
Management of gestational diabetes by:			
1. Life style modification	7(14%)	5(10%)	<0.001**
2. Exercise such as walking	8(16%)	3(6%)	
3. Insulin therapy	20(40%)	4(8%)	
4. All of the above	15(30%)	38(76%)	
Pregnant women with gestational diabetes and take insulin and complaining from uncontrolled blood glucose level may need			
1. Stop insulin	33 (66%)	2(4%)	<0.001**
2. Decrease the dose of insulin	10(20%)	6(12%)	
3. Go to doctor for increasing the dose of insulin	7(14%)	42(84%)	
4. I do not know	0(0%)	0(0%)	
When felling with symptoms of hypoglycemia			

1. Change the dose by increasing the insulin	0(0%)	0(0%)	0.001**
2. Go to bed	20(40%)	6(12%)	
3. Eat or drink sweet than call the doctor	28(56%)	39(78%)	
4. I do not know	2(4%)	5(10%)	
Hypoglycemia may be due to:			
1. Large dose of insulin	35(70%)	45(90%)	0.024*
2. Low dose of insulin	0(0%)	0(0%)	
3. Eating large amount of food	0(0%)	0(0%)	
4. I do not know	15(30%)	5(10%)	

Chi-square test, * Significant difference at p. value<0.05, ** Significant difference at p. value<0.01

Table 4: shows that management of gestational diabetes where 15(30%) and38(76%) women before and after education respectively correctly answered that all of line of management. with statistically significant difference where P value was 0.001**. As regards women who complaining from uncontrolled blood glucose level while7(14%) and 42(84%) women before and after education respectively correctly answered that eat or drink sweet than call the doctor. with statistically significant difference where P value was (0.001**). Regarding to causes of hypoglycemia, the commonest woman answered correctly35(70%) and 45(90%) before and after education respectively. where p value was 0.024.

Table 5: Knowledge of studied women about follow up of gestational diabetes mellitus before and after educational program

Items	Before(n=50)	After(n=50)	P value
Women with gestational diabetes			
1. Need to frequency of visits to diabetics' clinic	23(46%)	10(20%)	0.001**
2. She may need insulin to control blood glucose level	4(8%)	2(4%)	
3. She may affect by diabetes for a life	10(20%)	5(10%)	
4. All of the above	13(26%)	33(66%)	
In women with gestational diabetes do not take therapeutic diet; this may lead to:			
1. Hyperglycemia	15 (30%)	33(66%)	0.001**
2. Hypoglycemia	17(34%)	13(26%)	
3. normal level of blood glucose	10 (20%)	0(0%)	
4. I do not know	8(16%)	4(8%)	
After delivery:			
1. Need follow up	12(24%)	34(68%)	<0.001**
2. Does not need to follow up	0(0%)	0(0%)	
3. Need only for follow up if become pregnant Again	8(16%)	6(12%)	
4. I do not know	30(60%)	10(20%)	

- Chi-square test, ** Significant difference at p. value<0.01

Table 5: shows that Knowledge of studied women about follows up of gestational diabetes mellitus Where 15(30%) and 33 (66%) women before and after education respectively correctly answered that diabetes, mellitus needs to frequency of visits to diabetic's clinic. with statistically significant difference between knowledge before and after education where P value was 0.001. Regarding to women with gestational diabetes do not take therapeutic diet, 15 (30%) and 33 (66%) women before and after education respectively correctly answered that hyperglycemia. with statistical significant difference between knowledge before and after education where P value was 0.001. As regards necessary of follow up after delivery, 12(24%) and 34(68%) women before and after education respectively correctly answered that need follow up. with statistically significant difference between knowledge before and after education where P value was 0.001.

Table 6: Knowledge of studied women about complications of gestational diabetes mellitus before and after educational program

Items	Before(n=50)	After(n=50)	P value
Complications of diabetes mellitus on woman:			
1. Affected of peripheral nerves	18(36%)	2(4%)	
2. Affected on vision	9(18%)	3(6%)	<0.001**
3. Affected on kidney function	8(16%)	9(18%)	

4. All the above	15(30%)	36((72%)	
Complications of diabetes on baby's weight			
1. The baby's weight more than Normal	17(34%)	35(70%)	
2. The baby's weight less than normal	9(18%)	2(4%)	0.002**
3. The baby's weight is normal	18(36%)	9(18%)	
4. I do not know	6(12%)	4(8%)	

- Chi-square test, ** Significant difference at p. value<0.01

Table 6: shows that Knowledge of studied women about complications of gestational diabetes mellitus on woman Where 15(30%) and 36((72%) women before and after education respectively correctly answered that all of items was complications on woman. with statistically significant difference between knowledge before and after education where P value was 0.001. Regarding to complications of diabetes on baby's weightwhere17(34%) and 35(70%) women before and after education respectively correctly answered that baby's weight more than normal. with statistically significant difference. Where P value was 0.002.

Table 7: Comparison between max score of knowledge before and after educational program

	Max score	**Before education**	**After education**	**P. value**
Women knowledge about gestational DM	3	1.26±0.44	2.54±0.61	<0.001**
Knowledge of studied women about life Style	3	1.38±0.6	2.52±0.76	<0.001**
Knowledge of studied women about Management	4	1.7±0.65	3.28±1.09	<0.001**
Knowledge of studied women about follows up of gestational diabetes mellitus	3	0.8±0.73	2±0.81	<0.001**
Knowledge of studied women about complications of gestational diabetes Mellitus	2	0.64±0.48	1.42±0.5	<0.001**
Knowledge	**15**	**5.78±1.15**	**11.76±2.72**	**<0.001****

- Chi-square test, ** Significant difference at p. value<0.01

Table7: shows that comparison between max score of knowledge before and after education. Where data and score reflected statistical significance after receiving program at (P. value <0.001**).

Table 8: Relationship between Knowledge of studied women with their Characteristic data before and after educational program

	N	**Knowledge score**	
		Before education	**After education**
		Mean ±SD	**Mean ±SD**
Age			
20-<30	25	5.2±0.91	12.2±2.42
30-<40	21	6.19±1.08	11.48±3.11
40	4	7.25±0.5	10.5±2.38
P. value		**<0.001****	**0.428**
Parity			
<2	16	5.25±0.93	13±1.86
2-<4	32	5.94±1.13	10.83±2.78
More than 4	2	7.5±0.71	13.2±2.95
P. value		**0.011***	**0.014***
Level of education			
Primary	6	4.67±1.03	11.17±2.79
Secondary	30	5.6±0.72	11.93±2.73
University	14	6.64±1.39	11.64±2.84
P. value		**<0.001****	**0.812**
Family history of DM			
Yes	36	6.17±0.91	11.61±2.85
No	14	4.79±1.12	12.14±2.41
P. value		**<0.001****	**0.541**

Independent sample t- test **statistically significant difference p value<0.01

One Way An ova*** Significant difference at p. value<0.05, **Significant difference at p. value<0.01**

Table 8: Shows that Relationship between Knowledge of studied women with their Characteristic data before and after education. Where the women at age 40 years old were more knowledge than women at age 20-<30 before education, while all women's Knowledge increased at different age after program. As regard parity. Where women who had more than 4 deliveries more knowledge than women had less than 2 deliveries before education program, while all women's Knowledge increased after program. Regarding to level of education, all women's Knowledge increased after program than before program. As regards women with family history of diabetes mellitus, the women had family history of diabetes mellitus more knowledge than women didn't have history before program, while both of them nearly equal at knowledge after educational program.

Table 9: Maternal and Fetal Outcomes for Studied women after educational program

Items	Moderately educated (15)	Well educated (35)	P. value
Maternal outcomes			
- Pre-eclampsia	1(6.67)	4(11.4%)	0.997
- Weight gain	2(13.33)	3(8.6%)	0.997
Shoulder dystocia	2(13.33)	10(2.6%)	0.408
- Hydromania's	3(20.0)	6(17.1%)	0.875
Progress to diabetes mellitus	7(46.67)	12(34.36%)	0.614
Fetal outcomes			
No complication	9(60.0)	28(80.0%)	0.26
Hypo glycaemia	5(33.33	4(11.4%)	0.147
Malformation	0(0.00)	0(0.00)	-
- Still birth	0(0.00)	0(0.00)	-
Respiratory stress	1(6.67)	3(8.6)	0.735

- Chi-square test

Table 9: shows maternal and fetal outcomes after education, where there was no significant statistical difference between moderately and well-educated studied women, where p value was more than 0.0 5 at maternal and fetal outcomes.

DISCUSSION

Health training is one of the most efficient methods of intervention for prevention of disease, because they contribute to enhancement and maintenance of health due to improving health-related behavior. On the other hand, women with gestational diabetes (GD), are at higher risk of developing type 2 diabetes (DM), after delivery compared to those without gestational diabetes. Unfortunately, gestational diabetes with its demanding health cares and increasing economic costs is globally prevailing. **(Piepoli et al., 2016)**. Therefore, preventive measures against this difficulty are highly significant. The aims of the present study were to assessment studied women‟ knowledge of gestational diabetes (before education), implement structured teaching program regarding gestational diabetes, assess the improving of pregnant women‟ knowledge one month later (after education) and compare between knowledge of studied pregnant women before and after education-test.

Regarding demographic characteristics of the pregnant woman, most of studied women were aged from 20 to less than 30 years old, this not incomputable with **Khiyali et al., (2017)** who found the mean age of women at childbirth was 30.6 years. In addition to **Atkinson &Teychenne (2019)** who mentioned that majority of the pregnant women were less than 35 years old. There was evidence of an association between older maternal age and selected morbidities and complications. Older nulliparous women were at highest odds of gestational diabetes Although the age cut-off for elderly primigravidae is contested in the literature, age 35 years and older continues to be associated with poorer outcomes, and our findings support this association **(Cavazos-Rehg et al., 2015).** Regarding parity status the majority of the studied sample were multiparous 2 to 4. in this line **Rijvi et al., (2018)** found that more than half of the studied sample were multiparous. Overweight, they were suffered from hypertension and had family history of diabetes mellitus. After controlling for a number of factors, including age, body mass index and ethnic group, **Ethridge et al., (2014)** found that studied sample (pregnant woman with gestational diabetes) aged 35–40 years had. Our findings for gestational diabetes compare to those of **Rouholamin et al., (2014)** who reported gestational diabetes of women aged 35–39 years older. Whilst **Walker et al., (2010)** suggest that the level of increased risk for the 35–39-year group was 'not overly large and should be interpreted with caution', the increased risk for women aged 40 years and older was more likely to be clinically meaningful. Insulin resistance increases as a result of age and pregnancy hormones, and older age at childbearing is one factor amongst others contributing to the increased rates of gestational diabetes **(American Diabetes Association. 2017).** As regarding to blood pressure measures, the majority of the studied sample suffering from hypertension. Hypertensive disorders in pregnancy were higher for older women. Despite strong evidence of an association, its clinical significance is marginal.

The strength of the association is more likely to do with the very large data set. Several authors report an association between advanced maternal age and hypertensive disorders, and similarly to this study found odds ratios <1.5 in most cases. **(Shamsi et al., 2010).** However, **Dietl et al., (2015)** reported that women aged 35–39 years were at lower risk of hypertension compared to women aged younger than 35 years. The existing study represented that risk factors where the common was presence of first-degree relatives with diabetes mellitus in 22(44%) women followed by presence of multiple risk factors in12(24%). Our study confirms the previous reports that the risk factors for GDM are advancing age especially, >35 years old, obesity, and a history of neonatal death or a history of prior cesarean section. **American Diabetes Association. (2015)**. mentioned that, numerous factors raise a pregnant woman's risk of developing gestational diabetes, including: prediabetes (blood sugar that's elevated, but not high enough to be called diabetes), high blood pressure, a history of gestational diabetes, a family history of type 2 diabetes, hormone disorders, such as polycystic ovary syndrome (PCOS), being overweight, or gaining too much weight during pregnancy and being older than 25. In other hand **Gilbert et al., (2019)** mentioned that the risks associated with gestational diabetes are well recognized, it remains uncertain.

This study showed the comparison between of knowledge before and after education score and data reflected statistical significance after receiving program at (P. value <0.001). Staff nurses are expected to teach patients with diabetes effectively, but studies indicate that nurses are often uncertain about determining the proper content to teach and the teaching methods to use. Evidence suggests that patients with gestational diabetes are crisis oriented and may have barriers to learning the necessary skills for self- care. The importance of gestational diabetes mellitus knowledge among women is vital in reducing birth complications and outcomes.

This is because mothers are the most vital component to reducing health complications and birth outcomes through gestational diabetes mellitus knowledge **(Tryggvadottir et al., 2016).** Despite the fact that the post intervention score for knowledge increased for both groups, this increase was solely significant for intervention group. **Young-Hyman, et al., (2016),** emphasize on superficial knowledge about the gestational diabetes which can influence the promotion of self-care, treatment and disease control. Studies of **Tawfik, (2016),** also found a significant increase in level of knowledge for intervention group **Kaveh et al., (2012)** conducted a study on women with gestational diabetes and suggested that the mean level of knowledge increased significantly after training intervention. Although more than 90% of women with history of gestational diabetes acknowledged that history of gestational diabetes as a risk factor for future diabetes, but less than 10% these women believe that they were at high risk for the future diabetes gestational. (**Sadeghi et al., 2015).** Regarding the general aspects of gestational diabetes concept, physiopathology and risk factors, there was a larger increase in the knowledge, which is in agreement with other studies. In the present study, it is observed that there was an increase in the gestational diabetic women's knowledge about the disease. However, it cannot be stated that the knowledge the patients acquired actually had an effect on changing their lifestyles; that is, it cannot be affirmed that their behaviors changed. Furthermore, in the present study, the increase in knowledge regarding physical activity and eating was statistically significant.

The results show that the gestational diabetes education strategies, in general, had effects on the patients' knowledge, including behavior skills. However, the results regarding the knowledge acquired about the diet were smaller than more general knowledge about gestational diabetes, which is in agreement with other studies. There is a lack of studies about gestational diabetes education interventions performed by nurses and nutritionists. This is relevant as these health professionals play a role of great responsibility in educating pregnant women with gestational diabetes toward self-management. Some authors have also reported a significant difference in all measures used to assess the women's knowledge about aspects related to gestational diabetes and nutrition **(Gianfrancesco et al., 2018).** A systematic review of controlled and randomized studies about gestational diabetes patients' ability to self-manage their disease revealed that, in approximately six months, the patients' knowledge about eating habits improved. On the other hand, the results from the intervention regarding physical activity vary considerably **(Hossein et al., 2009).**

The change in the gestational diabetic woman's behavior in terms of their lifestyle is affected by the knowledge they have about their condition, as well as other factors like the meaning of the disease, risks and control methods. One study assessed the effectiveness of group education and found that it was effective in increasing the knowledge about self-monitoring capillary glucose, compared before and after implementing the educational program **(Cousins et al., 2003).** The study also showed a significant increase in the knowledge about how to detect the signs and symptoms of hypoglycemia and the suitable actions. The researchers reinforced this topic since it has been proven that patients in intensive treatment with insulin present an increase in hypoglycemia episodes. (**Handelsman et al., 2015**). It is important to understand that the diabetic patient's knowledge about the disease is the basis to achieve diabetes self-management, but knowledge acquisition does not necessarily mean a change in behavior **(Adam et al., 2018)** In this sense, the responsibility should be on the multi-professional team to, in addition to provide women with all necessary information about their disease, to follow them for some time, visiting them at home and helping them make decisions on the numerous situations imposed by the disease. Nurses play an important role in the multiprofessional team. Their role as caregivers is observed in nursing consultations and group activities. These activities allow for learning about the patients' real needs for coping with the disease. Furthermore, it helps them to become co-participants in their care.

The patients' effective participation in these teaching activities should motivate them to make changes in their life style with a view to increasing their self-esteem, their will to learn, to manage diabetes, and to improve their acceptance

of the disease. **(Melzak et al., 2018).** Regarding the comparison between before and after education related to Knowledge of studied women about life style for management of gestational diabetes mellitus. As regards effect of walking on blood glucose level and food avoided while majority of them before and after education respectively correctly answered that decrease in blood glucose level. In addition, the study showed regarding management of gestational diabetes where the majority answered correctly about all of line of management and eat or drink sweet than call the doctor. Also, a statistically significant difference between before and after education respectively with P value were (0.001**). Majority of studied sample answered correctly that diabetes mellitus needs to frequency of visits to diabetic clinic, women with gestational diabetes do not take therapeutic diet, and the necessity of follow up after delivery. Also, they answered correctly about complications of gestational diabetes mellitus on woman and on baby's weight. As statistical significance after receiving program at (P. value <0.001**).

The existing study revealed regarding the relationship between Knowledge of studied women with their Characteristic data before and after education, that the women at age 40 years old were more knowledge than women at age 20-<30 before education, while all women's Knowledge increased at different age after program. As regard parity. Where women who had more than 4 deliveries more knowledge than women had less than 2 deliveries before education program, while all women's Knowledge increased after program. Regarding to level of education, all women's Knowledge increased after program than before program. As regards women with family history of diabetes mellitus, the women had family history of diabetes mellitus more knowledge than women didn't have history before program, while both of them nearly equal at knowledge after educational program**. Ghahremani et al. (2016),** in agreement with results of our study. The results of the present study showed a significant increase in the mean scores of perceived benefits in the experimental group after the intervention.

In study by **Tang et al. (2015)**, women with gestational diabetes who perceived strong benefits to engaging in preventive measures The results of the present study showed a significant increase in the mean scores of Preventive behaviors in the studied sample after the program.. Previous studies reported improved behavior after the intervention, which similar to this study. Generally, the results of this study showed the effectiveness of the educational intervention on knowledge and attitude of pregnant women. In the studies by **Safarzadeh et al. (2014),** was confirmed the effectiveness of this training model. As regarding the women's outcome, the study showed that there was no significant statistical difference between moderately and well-educated studied women, where p value was more than 0.0 5 at maternal and fetal outcomes. Our study supports previous reports that women with GDM have a higher proportion of obstetric complications including pregnancy-induced fetuses that are of higher birth weight, are macrosomic, and infants who are large-for-gestational age **(Poston et al., 2016).** The principal pregnancy complication attributable to GDM is excessive fetal size or macrosomia. (**Usta et al., 2017).** However, it should be noted that the observed impacts of GDM on maternal and infant outcomes occur under the current universal screening, management and treatment of GDM. In addition, our data do not discriminate the effect of diabetic diet or insulin therapy.

Therefore, **Ornoy et al., (2015)** declared that; whether or not the therapy alters the effects of GDM on maternal and infant outcomes. It is left to be debated if the effects of GDM per se justify the universal screening, therapy, and fetal and maternal monitoring. Future studies are needed to compare the incidence of GDM-related maternal and fetal morbidity such as pre-eclampsia, premature rupture of membranes, cesarean section, preterm delivery, macrosomia and large-for-gestational before and after installation of the universal screening for GDM and to examine whether there is a trend in decreasing GDM related maternal and fetal morbidity after universal screening of GDM. Large randomized controlled trials of comparing universal screening and selective screening of high-risk populations will provide a final answer as to whether universal screening of GDM has any benefit in decreasing maternal and fetal morbidity. (**Tieu et al., 2017)**

CONCLUSION AND RECOMMENDATIONS

The educational intervention in the present study, was significantly effective on knowledge and attitude of pregnant women with gestational diabetes.

Future studies are required to investigate the impact of universal screening for GDM and to compare the incidence of GDM-related maternal and fetal morbidity before and after installation of that screening program.

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