

Effect of Structured Educational Session about Gestational Diabetes on Maternity Nurse's Knowledge at Selected Primary Health Care Hospitals, Egypt

Dr. Nagwa Abdel Fadeel A. Afefy

Assistant professor, Maternal and Newborn Health Nursing, Faculty of Nursing Cairo University, Egypt
Assistant professor, Woman & New Born Nursing, College of Nursing, King Saud bin Abdul-Aziz University
for Health Sciences – Riyadh, Kingdom of Saudi Arabia

Abstract

Gestational Diabetes (GD) has been recognized as a complication of pregnancy that will resolve after childbirth, but recent research has identified that this diagnosis may signify a lifetime of health issues. Its risk can be minimized if it properly managed. The aim of this study was to examine the effect of structured educational session on staff nurse's knowledge about gestational diabetes. A quasi experimental design was used to conduct the study. A convenience sample of 43 maternity nurses who provide care for women during childbearing period under the supervision of the Ministry of Health from different seven primary health hospitals in Giza governorate, Egypt. Data was collected by using self-administered close ended questionnaire which consisted of two parts: socio-demographic characteristics and knowledge assessment schedule (Pre-Post assessment). The educational session implemented seven times through a period of eight weeks to cover seven hospitals at Giza governorate. There was a significant improvement of the nurses' knowledge regarding GDM after the educational session which included definition, classification, diagnosis, risk factors and complication ($p = 0.000$ for each). Also the knowledge of the participants was significantly improved after the educational session regarding nursing management of GDM. This included diet, what to do with high or low blood glucose, how to count fetal movement and benefit of exercise ($p = 0.000$ for each). The total knowledge score increased significantly after the educational session ($P = 0.000$). This study demonstrated knowledge gap and inadequate practice by antenatal care givers in the management of gestational diabetes mellitus in the primary health care sector, and the educational session has a significant impact on nurse's knowledge regarding GDM.

Keywords: gestational diabetes, maternity nurse, educational session

1. Introduction

Pregnancy is a normal physiological process, which constitutes a unique period in the life of the woman and her family. In most cases, pregnancy does not show abnormalities, however, in some cases it could be affected by some complications that impose-stresses in both the woman and the fetus, so pregnancy is a critical event in a woman's life that affects her health and well-being (Avenshire& Enriquez , 2010). One of the most common complications that occur during pregnancy is the Gestational diabetes mellitus (GDM). It is described as glucose intolerance of varying severity with the onset of first recognition during pregnancy and disappears with delivery (Kaaja, & Greer, 2005). It is the major cause of macrosomia, perinatal mortality and usually associated by clinical hyperglycemia, hyperlipidemia, and hyper-insulinemia (American Diabetes Association. 2007; Gabbe, & Graves, 2003). The prevalence of GDM now a day is increasing, reached almost 15% - 20% all over the world (American Diabetes Association, 2014). However, there is considerable variation in the prevalence of GDM among different ethnic groups. It has been reported that GDM affects 1%–14% of all pregnancies depending on the population studied, and that its incidence has been steadily rising (American Diabetes Association. 2007).

The adverse effect of GDM on pregnancy is caused by maternal hyperglycemia, which stimulates fetal hyperinsulinemia, with subsequent increased and abnormal fat distribution in the fetus (Metzger, et al. 2010). A study done by (Metzger, et al., 2008) included 25,505 pregnant women at 15 hospitals in nine countries has confirmed that hyperglycemia at levels even lower than that for diabetes mellitus (DM) is associated with adverse pregnancy outcomes in a linear relationship. GDM is associated with considerable maternal and neonatal complications including increased rate of pre-eclampsia, cesarean section (CS) delivery, macrosomia, shoulder dystocia, preterm labor, and increased perinatal mortality (Crowther et al., 2005; Barakat, et al., 2010). In addition to the immediate effects of GDM on the pregnancy outcomes, evidence has emerged on the long-term effects of GDM on the women and their children including an increased risk of developing T2DM, maternal and childhood obesity, and cardiovascular disease (Metzger, 2007). There have been controversies on the screening and treatment of GDM (Vidaeff, et al., 2003). Some reports have shown the importance of universal screening and treatment in communities with a high prevalence of GDM and T2DM (Ezimekhai et al., 2006; Hiéronimus & Meaux 2010). Unmanaged gestational diabetes increases the risk of developing T2DM after pregnancy and predisposes the offspring to childhood obesity and T2DM later in life (Reece, et al. 2009).

The International Association of Diabetes and Pregnancy Study Group (IADPSG) recommended to use

of a 2-h 75 g oral glucose tolerance test for all pregnant women between 24 and 28 weeks of pregnancy to screen and diagnose GDM (Metzger 2010). Following the diagnosis of GDM, normalization of maternal blood glucose by nutritional regimens, and insulin if needed, is of paramount importance to prevent the complications of GDM as proved by the Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS) (Crowther, et al., 2005).

To decrease gestational diabetes-related mortality, appropriate prenatal care must be available to all women. Early detection, careful monitoring, and treatment are crucial in preventing mortality related to this disorder. So this study was carried out to assist the nurses to gain knowledge and skills about gestational diabetes and hyperglycemic control.

2. Significance

Similar to many countries in the Middle East, there is scarceness of information on the standard of health services provided to diabetic pregnant women in Egypt, in addition to lack of national guidelines for the screening and treatment of diabetes during pregnancy. Moreover, clinical practice has shown that, nurses in primary health care hospitals have little knowledge about gestational diabetes effect, management, as well as nursing care measures to minimize complications and to educate the pregnant women self-care measures. Also ensuring health care services for pregnant women, are recommended by providing high quality educational sessions to the nurses. Moreover, enhancing nurse's knowledge and practice; may help to reduce the maternal morbidity and mortality.

It is important for primary care providers, including practice nurses, to be up-to-date with current diagnostic criteria, treatment and management of gestational diabetes to reduce adverse outcomes. In addition, women who have gestational diabetes will have a 7% lifetime risk of developing type 2 diabetes in the future, as pregnancy unmasks susceptibilities to insulin resistance (Bellamy, et al 2009). Up to date, there is no study in Egypt assessed nurse midwife knowledge regarding gestational diabetes or implement an educational sessions to enhance knowledge about gestational diabetes among staff nurses. Therefore this study is needed to improve quality of antenatal care among nurses to optimize the health of the women and their babies. Also, these nurses will be a focus group for other staff nurses.

Aims of the study:

To examine the effect of structured educational session on staff nurse's knowledge about gestational diabetes.

3. Subjects and Methods

3.1 Research hypothesis

Educational sessions about gestational diabetes will significantly improve the nurse's knowledge at the primary health care hospitals.

3.2 Design

Quasi-experimental design (pre-posttest) was used to examine the effect of structured educational session on staff nurse's knowledge about gestational diabetes. This aim would be achieved through:

- 1- Assessment for the nurses Knowledge about gestational diabetes
- 2- Designing and implementing an educational session about gestational diabetes
- 3- Evaluate the effect of the educational session on the nurses Knowledge for women with gestational diabetes.

3.3 Sample

A convenient sample of 43 maternity nurses who provide care for women during childbearing period under the supervision of the Ministry of Health from different seven primary health hospitals in Giza governorate, Egypt were recruited regardless their age, educational level and years of experience. An official permission of Undersecretary of Ministry of Health and Population (MOHP), and permission of the primary health care hospital directories was obtained to conduct the study. Prior to conduct the study, the participants were informed about the purpose of the study in order to obtain their acceptance to share in the study. Nurses who agreed to participate in the study signed a Free and Informed Consent Form. All events that occurred during the training session were considered confidential, and ensure that every data and information that they share were treated as confidential, and used only for the purposes of the study. Also, the participants knew their right to withdraw at any time and make it clear that the study is totally voluntary.

3.4 Tools:

Data of the current study collected by using self-administered close ended questionnaire which consisted of two parts. Part I was socio-demographic characteristics and part II was knowledge assessment schedule (Pre-Post assessment).

3.4.1 Socio-demographic characteristics

This questionnaire was developed by the researcher to collect data related to socio-demographic data, such as age, educational levels, years of experiences, and previous training program attended.

3.4.2. Knowledge assessment Schedule (Pre-Post assessment):

This was developed by the researcher according to reviewing of literature to assess nurses' knowledge regarding gestational diabetes. It consisted of 15 questions related to definition, classification, complications, diagnosis, nursing intervention for gestational diabetes, ante natal care component and concept of high risk pregnancy. It was written in an Arabic language in the form of close ended questions. Close ended questions was assigned a score of (2) given when the answer was completely correct, a score (1) was given when the answer was incompletely correct and a score (0) was given when the answer was incorrect. The questionnaire was administered twice once before the session (pretest) and once after the session (posttest).

3.4.3. Tools Validity and Reliability

The tool validity was checked by face validity by giving the questionnaire to five expertise in maternity nursing, and asked them to read it and evaluate the content in terms of whether it reflect the concepts intended to measure; and to determine its readability and clarity to reach consensus on the best form to be implemented. The necessary modification was done in form of adding and omission of some questions. To measure the internal consistency of the questionnaire Cronbach's alpha coefficient was used through pilot sample of 10 nurses and enter their data into SPSS to get the Cronbach's alpha which was more than 0.7 to ensure the reliability and clarity of the questionnaire and they were excluded from the study. The result helped to rephrase the some questions.

4. Procedure

A review of the current and past relevant literatures using the available local and international books, magazines and internet was done to identify the nursing care provided for women having gestational diabetes and to develop the study tools and the content of the training session. An official permission was obtained. The educational session was implemented for a group of (5-6) nurses according to their schedule from each primary health care hospital. The educational session implemented seven times to cover seven hospitals at Giza governorate. The total session was seven through a period of eight weeks. The duration of each session was ranged from one and half to two hours including periods of discussion according to their achievement, progress and feedback. At the beginning of the session an orientation to the educational session and its aims took place, Arabic language was used to suit the nurses' level of understanding. The session started by stating the objectives of the educational session, then distributed self-administered questionnaire (pretest). After finishing pretest, the researcher started the theoretical part of gestational diabetes as: definition, classification its effect on maternal fetal/neonatal outcomes, diagnosis and nursing intervention, in addition to component of antenatal care, and concept of high risk. Different methods of teaching were used such as lecture, group discussion, and case scenario. Instructional media included data show and handout prepared by the researcher and distributed to all nurses included all the theoretical part. Nurses were motivated and encouraged to cooperate and participate actively in the study. After implementation of the educational session, an evaluation of nurse's knowledge was carried out through post-test, to assess the same nurse's knowledge about gestational diabetes.

Data Analyses

Data was coded and analyzed by using the computer through statistical package for social sciences (SPSS) version 20. According to the objectives of the study the description of variables was done by using frequency distribution for categorical variables and means with standard deviations for continuous variables. Cronbach's alpha: to measure study instrument reliability.

Wilcoxon Signed Ranks Test was used to compare the ordinal data before and after the educational session.

Level of significance

For all statistical tests done; the threshold of significance was fixed at the 5% level (P-value). A P-value > 0.05 indicates non-significant result and the P-value <0.05 indicates a significant result and the P-value is the degree of significance. The smaller the P-value obtained; the more significant is the result; the P-value being the probability of error of the conclusion (Munro; 1997).

5. Results

The age range of the sample was 18-35 years old with mean age 26.69 ± 5.11 years. The majority (95%) were graduated from Secondary school diploma. More than half (55.8%) had experience in maternity nursing more than 11 years (table, 1). Near half (44.8%) had previous maternity training and the majority (73.68%) had their training at the hospital. Only 13.95% attended previous conferences about GDM (table, 2).

Table (1)
Socio-demographic Characteristics of Studied Nurses

Characteristics of nurses	n= 43	
	Number	Percent
Age (years)		
Less than 20	5	11.6
20 -24	10	23.3
25 - 30	17	39.5
≥ 30	11	25.6
Mean ± SD26.69±5.11		
Education		
Secondary school diploma	40	95.0
Technical institute	3	5.0
Experience (years)		
< 3	5	11.6
3 – 10	14	32.6
>10	24	55.8
Mean ± SD9.58± 4.89		

Table (2)
Frequency Distribution of the sample Previous Training of the Studied Nurses

Characteristics of nurses	n= 43	
	Number	Percent
Taking training		
Yes	19	44.18
No	24	55.82
Type of training taken (n= 19)		
Private	5	26.32
In hospital	14	73.68
Attend previous conference about GDM		
Yes	6	13.95
No	37	86.05

Impact of Structured Educational Session on Nurses' Knowledge about GDM

Wilcoxon Signed Ranks Test was used to compare the nurse's knowledge before and after the educational session. There was statistically significant improvement in the nurses' knowledge after the educational session regarding definition of gestational diabetes, classification, and concept of high risk pregnancy ($p = 0.000$ for all) (table, 3). The percentage of the nurses who define GDM correctly was almost doubled after the educational session as it was 37.2 % before the session, and it was increased to 86%. The percentage of the nurses who correctly answered GDM classification was increased from 16.3% before the session to 88.4% after the session. Moreover table (3) showed the comparison of correct knowledge about concept of high risk pregnancy, effect of GDM on maternal and fetal outcome, and risk factors for GDM before and after educational session. There was statistical significant improvement after the educational session ($p=0.000$ for all).

Regarding to GDM diagnosis Table (4) showed that, there was statistically significant improvement in nurses' knowledge after the session in correctly knew GDM diagnosis, which included how to perform glucose tolerance test (GTT), glucose challenge test , normal range of fasting blood sugar, and the suitable time to check blood sugar during pregnancy ($p = 0.000$, for all). As a few nurses correctly answered what is glucose tolerance test (GTT), glucose challenge test, and the suitable time to check blood sugar during pregnancy before the educational session (14%, 7%, 9.3%) respectively. After educational session, their knowledge's were highly improved (88.4%, 83.7%, 100%) respectively.

Table 3: Comparison of the Nurses' Knowledge about GDM before and after the Educational Session

GDM Knowledge	Pre-correct answer		Post-correct answer		P
	No	%	No	%	
Definition of GDM	16	37.2	37	86	0.000
Classifications of GDM	7	16.3	38	88.4	0.000
Concept of high risk pregnancy	8	18.6	40	93	0.000
Maternal complications	7	16.3	40	93	0.000
Fetal complication	9	20.6	34	79.1	0.000
Risk factors for GDM	10	23.3	34	79.1	0.000

Table 4: Comparison of the nurses' Correct Knowledge about diagnosis of GDM before and after the Educational Session

Diagnosis of GDM	Pre-correct answer		Post-correct answer		P
	No	%	No	%	
How to diagnose GDM	7	16.3	43	100	0.000
What is glucose tolerance test (GTT)	6	14	38	88.4	0.000
WHAT IS glucose challenge test	3	7	36	83.7	0.000
Normal range of fasting blood sugar	18	41.9	42	97.7	0.000
Suitable time to check blood glucose during pregnancy	4	9.3	43	100	0.000

Table 5: Comparison of the nurses' Correct Knowledge about nursing management of GDM before and after the Educational Session

Nursing management	Pre-correct answer		Post-correct answer		P
	No	%	No	%	
Nursing care for women with GDM	9	20.9	41	95.3	0.000
Recommended diet for women GDM	18	41.9	43	100	0.000
What to do when the woman has constant high blood glucose	13	30.2	40	93	0.000
What to do when the woman has constant low blood glucose	9	20.9	43	100	0.000
How teach the woman to count fetal movement	13	20.2	43	100	0.000
What is the benefit of exercise for GDM woman	9	20.9	43	100	0.000

Comparison of the nurses' correct knowledge about management of GDM before and after the educational session, Wilcoxon Signed Ranks Test revealed significant improvement of their knowledge after the session on the appropriate nursing care for women with GDM, the recommended diet, what to do with high or low blood glucose level, how to teach the women to count fetal movement, and what is the benefit of exercise ($P = 0.000$ for all). All nurses correctly answered the management strategies questions after the session (100%), except for the appropriate nursing care for women with GDM, and what to do with high blood glucose level, it was (95.3%, and 93%) respectively. Moreover, the current study result showed that, there was a poor correlation between years of experience and gestational diabetes knowledge ($r = 0.2152$, $p < 0.001$).

6. Discussion

Gestational diabetes mellitus (GDM) is strongly associated with adverse outcomes on women's health and the health of their babies [Bellamy et al., 2009; Feig et al., 2008]. Many researches have been identified that gestational diabetes signify a lifetime of health issues, with future risk of type 2 diabetes mellitus (T2DM) (Baptiste-Roberts et al., 2009; Bellamy, et al., 2009). Nurses have an important and significant role in prevention and minimization of the adverse effect of GDM. Therefore, a structured educational session was conducted to 43 nurses at different primary health care hospitals at Giza Governorate, Egypt, to equip them with the adequate knowledge regarding gestational diabetes mellitus.

There is a rare studies on GDM especially in assessing knowledge and practice of antenatal nurses. This study showed a varying level of knowledge of nurses providing antenatal care for pregnant women attending primary health care hospital. The current results showed a significant improvement in nurse's knowledge after the educational session. The results revealed that the minority have knowledge about the definition, classification and effect of GDM on pregnancy outcome before the educational session. This lack of knowledge may related to their level of education, and their years of experience. Also, most of the sample graduated from secondary school, about half of the sample had experience less than 10 years, and the majority didn't attend conference about GDM. Antos, et al., (2013), in their study about midwives' knowledge about gestational diabetes, indicated that, the level of midwives knowledge was high and satisfactory. As the majority of these midwives (89%) able to define

gestational diabetes correctly, 94% knew the symptoms. This differences may related to the sample characteristics. As most midwives were between 31 and 45 years of age, near half graduated from medical colleges (41%), and 39% of them had a Bachelor's degree in obstetrics, while 20% had a Master's degree in obstetrics. Moreover, 35% of them was between 11 and 20 years work experience. Also Adeleke, et al., (2014), in their study to assess the knowledge, attitude and practice of ante-natal care givers in Oyo state, reported that 70 % of the nurses defined GDM correctly.

The current study showed a significant improvement in nurse's knowledge regarding diagnosis of GDM. As in pretest, the minority correctly answered how to diagnose GDM, what is glucose tolerance test. However, near half of them correctly knew the normal range of fasting blood sugar in pre-test assessment. Adeleke, et al., (2014), reported that only 10% nurses correctly answered how to diagnose GDM. In contradiction, Antos et al., (2013), stated that most of midwife nurses able to specify when glucose tolerance test are performed, but half of the sample (51%) able to describe how to reform glucose tolerance test. In relation to GDM complications, there was a highly statistical significant knowledge improvement before and after educational session. This differences may reflect a limited exposure to GDM cases in the health center. In contrast, Adeleke et al., (2014) mentioned that most of nurses recognized the complications of GDM.

It is expected that more qualified and more experienced nurses should be more knowledgeable about nursing care during pregnancy and able to manage high risk pregnancy. Also, they should have more training and involved in relevant skills to enhance their practice and teach young nurses. The current results showed poor correlation between years of experience and knowledge. This may related to that they haven't enough time to attend workshops or programs in continuing education. In addition most of them graduated from secondary school. This finding is matched with Odili and Eke (2010), who assessed knowledge of diabetes mellitus among registered nurses in Benin City and stated that most of nurses were not able to answer all question. Also, similar find was supported by Rubin, et al., (2007).

7. Conclusion

This study demonstrated knowledge gap and inadequate practice by antenatal care givers in the management of gestational diabetes mellitus in the primary health care sector. There is a need for continuous professional education to enhance care givers knowledge and practice to provide satisfactory level of care for a women with GDM. Moreover, the educational session has a significant impact on nurse's knowledge regarding GDM.

8. Recommendations

Regular educational training tailored to improve nurses' level of knowledge. Supply nurse midwife with manual containing needed knowledge about GDM and how to provide adequate nursing care for woman with gestational diabetes as well as how to counsel and teach pregnant women about diet, exercise, fetal movement count and danger signs during pregnancy. Update nurses knowledge by attending workshops, conferences and training programs. Concerted efforts, involving all health care provider, to strengthen and empower the public health sector in health promotion, disease prevention and management, will certainly help reduce the impact of gestational diabetes. Extra attention from the government, ministry of health, and the community to the nurses in the primary health hospital to enhance and improve their knowledge and practice by regular training workshops. Further researches focus on impact of educational session on the nurse's practice and attitude at different sitting.

Conflict of interest

There is no conflict of interest

References

- Adeleke NA, Olowookere SA, Farinloye EO, Abiodun OM, & Alebiosu CO (2014). Management of Gestation Diabetes Mellitus at Secondary Health Care Level: A Survey of Knowledge, Attitude and Practice. *Research Journal of Health Sciences*. Vol 2, No 1
- American Diabetes Association (2007). Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 30:S45–S46.
- Antos E., Nowak B, Olszewski C I. (2013). The analysis of midwives' knowledge on the education of women with gestational diabetes and preparation for it. *Journal of Public Health, Nursing and Medical Rescues*. No.4 (29-36)
- American Diabetes Association (2014). Standards of Medical Care in Diabetes. *Diabetes Care*, 37, S14-S80. <http://dx.doi.org/10.2337/dc14-S014>
- Avenshine, M., and Enriquez, M., (2010): *Comprehensive maturity nursing*, 4th ed., Jones & Bartlett, Boston, p 567
- Baptiste-Roberts, K., Barone, B. B., Gary, T. L., Golden, S. H., Wilson, L. M., Bass, E. B., & Nicholson, W. K. (2009). Risk factors for type 2 diabetes among women with gestational diabetes: A systematic review.

- The *American Journal of Medicine*, 122, 207-214. doi:10.1016/j.amjmed.2008.09.034
- Barakat MN, Youssef RM, Al-Lawati JA. (2010). Pregnancy outcomes of diabetic women: charting oman's progress towards the goals of the Saint Vincent Declaration. *Ann Saudi Med*;30:265–270.
- Bellamy, L., Casas, J.P., Hingorani, A. D., & Williams, D. (2009). Type 2 diabetes Mellitus after gestational diabetes: A systematic review and meta-analysis. *Lancet*, 373, 1773-1779.
- [Cited Here...](#) | [View Full Text](#) | [PubMed](#) | [CrossRef](#)
- Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS (2005). .Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. *N Engl J Med*; 352:2477–2486.
- Ezimokhai M, Joseph A, Bradley-Watson P.(2006). Audit of pregnancies complicated by diabetes from one center five years apart with selective versus universal screening. *Ann N Y Acad Sci*; 1084:132–140.
- Feig DS, Zinman B, Wang X, Hux JE. (2008). Risk of development of diabetes mellitus after diagnosis of gestational diabetes. *Can Med Assoc J* 179:229–34.
- Gabbe SG, Graves CR (2003). Management of diabetes mellitus complicating pregnancy. *Obstet Gynecol.* 102:857–868. [[PubMed](#)]
- Hiéronimus S, Le Meaux JP. (2010). Relevance of gestational diabetes mellitus screening and comparison of selective with universal strategies. *Diabetes Metab*; 366 Pt 2575–586.
- [https://www.worlddiabetesfoundation.org/sites/default/files/WDF%20Annual Review 2013.pdf](https://www.worlddiabetesfoundation.org/sites/default/files/WDF%20Annual%20Review%202013.pdf)
- Kaaja RJ, Greer IA (2005). Manifestations of chronic disease during pregnancy. *JAMA.*; 294:2751–2757.[[PubMed](#)]
- Metzger BE, Contreras M, Sacks DA, Watson W, Dooley SL, Foderaro M, et al., (2008). Hyperglycemia and adverse pregnancy outcomes. *N Engl J Med*; 358:1991–2002.
- Metzger BE, Persson B, Lowe LP, Dyer AR, Cruickshank JK, Deerochanawong C, et al..(2010). Hyperglycemia and adverse pregnancy outcome study: neonatal glycemia.*Pediatrics*;126: e1545–e1552.
- Metzger BE. (2010). International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care*2010;33: 676–682.
- Metzger BE. (2007). Long-term outcomes in mothers diagnosed with gestational diabetes mellitus and their offspring. *Clin Obstet Gynecol*: 50:972–979.
- Odili VU.,& Eke J., (2010). Knowledge of Diabetes Mellitus among Registered Nurses in Benin City *International Journal of Health Research*, September; 3(3): 145-151
- Reece, E.A., Leguizamon, G. and Wiznitzer, A. (2009) Gestational Diabetes: The Need for a Common Ground. *The Lancet*, 373, 1789-1797. [http://dx.doi.org/10.1016/S0140-6736\(09\)60515-8](http://dx.doi.org/10.1016/S0140-6736(09)60515-8)
- Rubin, D. Moshang, J. Jabbour j., (2007). Diabetes Knowledge: Are Resident Physicians and Nurses Adequately Prepared to Manage Diabetes?. *Endocrine Practice: January 2007*, Vol. 13, No. 1, pp. 17-21.
- Vidaeff AC, Yeomans ER, Ramin SM. (2003) Gestational diabetes: a field of controversy. *Obstet Gynecol Survy*;58:759–769.