Preconception Care of Diabetic Women in Reproductive age

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Abstract

Background: Pregnancies of diabetic women have increased risks of fetal congenital malformations and maternal morbidities. Preconception care for these women may reduce the risks of major malformations and perinatal mortality. **The aim** of this study was to evaluate the effect of counseling program on knowledge of diabetic women in preconception care.
Methods: This quiz experimental study was done in Diabetes outpatient clinics that are affiliated to Ministry of health (MOH) hospitals in Assiut city, on 140 diabetic women of reproductive age who were interviewed for assessment of their preconception care knowledge and for counseling program of its items. **Results**: The majority of women in the present study suffered from type 1 diabetes (86.4%), lived in urban areas (61.4%), and achieved intermediate educational degrees (51.4%). Nineteen percent showed previous history of spontaneous abortion. The used counseling program resulted in significant improvement ($p<0.05$) of diabetic women's knowledge regarding preconception care that was significantly associated with their higher educational level ($p<0.001$).
Conclusions: The given counseling program led to higher resulted in significant improvement of preconception care knowledge improvement that was increased by the high women's educational level.

Key words: Diabetic women, fetal and maternal morbidities, counseling program before pregnancy.

Introduction

The prevalence of type 2 diabetes mellitus continues to rise worldwide **[Bringer et al 2009, and Wild et al, 2004].** In the Arab region, the number of deaths attributed to diabetes is about 170,000 adult people, representing more than 10% of all deaths in the region **[Boutayeb et al, 2012]**.It is well known that pregnancies of diabetic women; whether type 1 or type 2, have two to four folds higher risks of congenital malformations than those of non-diabetic women [**Allen et al, 2007 and Banhidy et al, 2010**]. Malformations associated with maternal diabetes includes circulatory, gastrointestinal, musculoskeletal, and genitourinary systems [**Frias et al, 2007 and Lisowski et al, 2010**], as well as macrosomia and increased risk of prenatal mortality **[The Diabetes and Trial Research Group, 1996].**

In many population based studies, the frequency of major congenital malformations among infants of women of type 1 and type 2 diabetes ranged from 2.9% to 7.5% and from 2.1% and 12.3% respectively **[Bell et al, 2008 and Gonzalez et al, 2008].** Diabetes in pregnancy is also associated with risks of maternal morbidity such as miscarriage, pre-eclampsia, and preterm labor **[Ray et al, 2004]**. Reported studies stated that preconception care for diabetic women is found to reduce the risk of major malformations [**Banhidy et al, 2010**], lower perinatal mortality **[Pearson et al, 2007 and Tripathi et al 2010]** and may decrease the risk of fetal macrosomia **[Kitzmiller et al, 2010]**.

According to Canadian Diabetes Association clinical practice guidelines [**Meltzer et al, 1998**], any woman with diabetes should be assessed for level of glycemic control and status of any diabetic complications. Preconception evaluation should consist of physical examination and laboratory investigations. Hemoglobin (HbA1C) should be measured. Epidemiological studies indicate that A1C test values up to 1% above normal are associated with rates of congenital malformations and spontaneous abortions that are not greater than rates in non-diabetic pregnancies. However, rates of each complication continue to decrease with even lower A1C test levels. Thus, the general goal for glycemic management in the preconception period and during the first trimester should be to obtain the lowest A1C test level possible without undue risk of hypoglycemia in the mother [**American Diabetes Association, 2003**]. Creatinine clearance and 24-hour microalbumin excretion tests are required before conception and at regular intervals during pregnancy. Referral to an ophthalmologist for evaluation of any pre-existing retinopathy should be made [**Meltzer et al, 1998**]. Counseling program before pregnancy should involve discussion of the risk of transmitting diabetes, the risk of congenital anomalies, fetal and maternal complications of pregnancy, and the need for pregnancy planning [**Klinke and Toth, 2003**].

The aim of the study

The aim of this study was to evaluate the effect of counseling program on knowledge of diabetic women in preconception care.

Methods:

Study design: The current research is a quiz experimental study.

Setting: This study was done in Diabetes outpatient clinics that are affiliated to MOH hospitals in Assiut city, where treatment and follow up of diabetic patients take place. during period of study between September 2015 to August 2016.

Inclusion criteria: The current study encompassed diabetic married patients (in reproductive age) who experienced pregnancy and delivery.

Exclusion criteria: Women who were in menopause (postmenopausal women), pregnancy (pregnant women), suffered of comorbidities other than diabetes as ischemic heart disease, hypertension, renal impairment, or hepatic disease.

Sample: The prevalence of diabetes among Egyptian population is 10.4% [**Soliman, 2013**]. Sample size based on our study design (quiz experimental prevalence study), was calculated according to the following formula: $N=Z^2 xP(1-P)/d^2$ [**Danial, 1999**]. At prevalence of 10.4%, confidence level of 95%, and 5% precision, the calculated minimum sample size was 138 women. The authors obtained a larger sample size of 140 diabetic women in reproductive age. These women were interviewed to collect socio-demographic and obstetric history data as well as preconception care knowledge.

Data collection tools: The researchers' prepared four tools were utilized to collect data in this study. It was based on literature review.

Tool I: - socio-demographic data: The collected socio-demographic data entailed age, education, occupation and residence. The obstetric history data collected included numbers of pregnancies, deliveries and abortions as well as different types of delivery.

Tool II:- pretest assessment: This tool was developed by the researcher's used to assess the knowledge of Diabetic women that were asked about the main cardinal items

regarding pre-conception care before discussing the prepared booklet (counseling program) with them .

Tool III:- counseling program: This tool was describing essential basic knowledge regarding preconception care for diabetic married women in child bearing age (18 – 45 years) The main 5 preconception care points discussed were; **Pregnancy planning** (3 points): To avoid pregnancy before glucose adjusting to avoid fetal and maternal complications. Fetal complications included malformations, macrosomia. Maternal complications included abortion, polyhydramnios. **Physical examination and investigations** (3 points) of Blood Pressure, laboratory studies (as hemoglobin A1C and creatinine clearance) and Ophthalmological & Neurological examination**. Adjusting Bl. Glucose level** (3 points) with Monitoring blood glucose level, Adjusting insulin dosage, and knowing Manifestations of hyperglycemia (thirst, polyuria, fatigue, headache) and hypoglycemia (profuse sweeting, headache, drowsiness, blurring of vision, coma)**. Diet control** (3 points) with Low Sugar, Low Salt and Low Fat, Dietician cooperation, and Folic Acid supplements. **Exercise** (3 points) with Pre-exercise glucose monitoring, Post-exercise glucose monitoring and Weight control.

Tool IV: - posttest assessment: This tool was Comparison of pretest and posttest data was done for diabetic women regarding their knowledge about cardinal items of preconception care. In posttest sitting, a Likert type scale was utilized to assess the knowledge level regarding each cardinal point, where "0" : none; "1": poor; "2": medium; and "3": good. A possible relation between the educational level of women and their knowledge level in posttest sitting was analyzed using Kruskal-Wallis test.

Procedure: This study was conducted by two researchers, one with doctoral degree of obstetric and gynecological nursing and one with doctoral degree of medical and surgical nursing. The women in our study were interviewed to assess knowledge regarding pre-conception care (pre-test assessment) and discussing counseling program by prepared booklet "pregnancy and diabetes" Diabetic women were interviewed for 30 minutes. Post-test assessment was then done to reassess women's knowledge regarding components of preconception care in details.

Ethical considerations:

The current study was approved by local ethical committee of Faculty of Nursing, Sohag University, Egypt. Written or oral consent was taken from all study women.

Statistical analysis: Socio-demographic data, as well as data of obstetric history and preconception knowledge were tabulated where mean, medians and percentages were used. Pretest/posttest data comparison was done using Fisher's exact test. A possible relation between educational level of study women and their knowledge level was analyzed using Kruskal-Wallis test.

Results:

Characteristics of women in the present study showed that the median age was 32 years (range 20-40 years). Lived in urban areas (61.4%), and achieved intermediate educational degrees (51.4%; at preparatory (4.3) and secondary schools (47.1)), while 24.3% achieved a higher educational level (Table1).

Table 2; show the characteristics of women in the present study showed. The majority of our women suffered from type 1 diabetes (86.4%).

Table 3; show the reproductive profile of the women in the present study reveal that

only 19.4% of women (n= 27) showed positive obstetric history of spontaneous abortion while the remaining women (n= 113; 80.6%) did not give history of previous abortion.

Table 4; show the majority of women in our study (n=84; 60%), underwent cesarean section for delivery of previous pregnancy.

Table5; showed that women knowledge regarding preconception care items were significantly improved by counseling program. The comparison between pre-test and post-test evaluation revealed that the given counseling program improved knowledge of pregnancy planning (p=0.0166), control of blood glucose (p=0.0001), physical examination (p=0.0002), diet (p<0.0001), and exercise (p<0.0001).

Figure (1) shows effect of counseling program on pre conception care knowledge score

Table 6; show the relation between educational levels of our diabetic women and their levels of preconception care knowledge was analyzed by Kruskal-Wallis test. Higher educational level was found to be associated with higher knowledge level (p<0.001).

Table 1: Socio- demographic data of diabetic women in reproductive age

variable	NO	%
Age Median Age range	23 years 20 - 40 years	
Educational level Illiterates Read and writes, primary school Prep school Secondary school Institutes for 2 year after secondary school University degrees	16 18 6 66 10 24	11.4 12.9 4.3 47.1 7.2 17.1
Residence Urban Rural	86 54	61.1 38.6
Total	140	100

Table 2: Characteristics of women according to type of diabetes to women in reproductive age

variable	NO	%
Type of diabetes Type1 Type2	121 19	86.4 13.6
Total	140	100

Table 3: Obstetric history of diabetic women in reproductive age according to pregnancy, parity and abortion.

Obstetric history	NO	%
Pregnancy, parity and abortion:		
Gravida 1, Para 1 & Abortion 0	16	11.4
Gravida 2, Para 2 & Abortion 0	38	27.1
Gravida >2, Para >2 & Abortion 0	59	42.1
Gravida 2-8, Para1-7 & Abortion 1	18	12.9
Gravida 3-5, Para 1-3 & Abortion 2	6	4.3
Gravida 7-8, Para 4 & Abortion 3-4	3	2.1
Total	140	100

Table 4: Obstetric history of diabetic women in reproductive age according to type of labor.

Obstetric history	NO	%
Type of labor:		
Vaginal	56	40
CS	69	49.3
Vaginal, CS	15	10.7
Total	140	100

Table 5: Analysis of preconception care knowledge items that might be affected by counseling program.

| P value	Pre-test		Post-test		P value
	NO	%	NO	%	
Pregnancy planning					*0.0166*
*Mentioned	57	40.7	78	55.7	
*Not mentioned	83	59.3	62	44.3	
Control of blood glucose					*0.0001*
*Mentioned	54	38.6	87	62.1	
*Not mentioned	86	61.4	53	37.9	
Physical exam.					*0.0002*
*Mentioned	42	30	74	52.9	
*Not mentioned	98	70	66	47.1	
Diet					*<0.0001*
*Mentioned	33	23.6	76	54.3	
*Not mentioned	107	76.4	64	45.7	
Exercise					*<0.0001*
*Mentioned	35	25	78	55.7	
*Not mentioned	105	75	62	44.3	
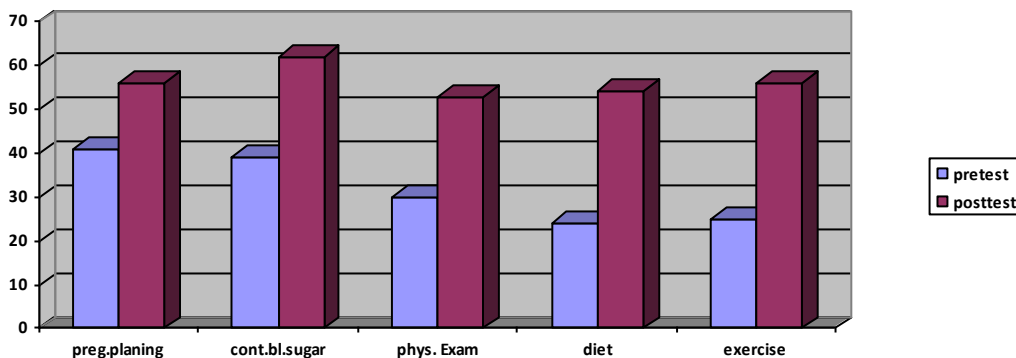
Figure (1) pre and post counseling program test score

Table 6: The relation between educational and preconception care knowledge levels among diabetic women in child bearing age.

Educational level	No.	Knowledge level, Mean ± SD	Knowledge level, Median	95% C.I.
1	16	0.25 ± 0.447	0.00	0.01 - 0.49
2	18	0.22 ± 0.428	0.00	0.01 – 0.43
3	6	1.00 ± 0.894	1.00	0.06 – 1.94
4	66	1.20 ± 0.845	1.00	0.99 – 1.40
5	10	1.20 ± 0.789	1.00	0.64 – 1.76
6	24	2.21 ± 0.932	2.00	1.81 – 2.60

N.B. Difference was found to be significant ($p < 0.001$) by Kruskal-Wallis test

Discussion:

In contrast to developed countries where most people with diabetes are above pension age, the majority of diabetic people in the Arab region are under 60 years of age and in the peak of their productive years [**Boutayeb et al, 2012**], including women in the child bearing age. Therefore, there are an increased proportion of pregnancies of diabetic women in developing countries [**McElduff et al, 2005 and Bell et al, 2008**] including Egypt, resulting in higher risk of fetal and maternal morbidity and mortality [**Mahmud and Mazza, 2010**]. Based on the fact that congenital malformation is induced early in pregnancy (in the preovulatory oocyte or preim plantation embryo) and is associated with hyperglycemia, care with treatment of diabetes and folic acid supplementations should be undertaken before pregnancy [**Kitzmiller et al, 2010**].

Subsequently, preconception care is crucial and pivotal for diabetic women of child bearing age.

The current study is a quiz experimental prevalence study addressing the preconception care knowledge in diabetic women. Sample size calculation for a study estimating a population prevalence has been shown by Daniel [**Danial, 1999**], and depends on "Z statistic of 1.96" for 95% confidence level, 10.4% expected prevalence of diabetes among Egyptian population aged 10–79 years [**Soliman,2013**], and 95% confidence interval. Accordingly, the calculated sample size was 138 cases. However, our study included 140 diabetic women of child bearing period with median age of 32 years (range: 20 to 40 years). Most of our women received preparatory and secondary school education as well as higher educational levels. This is comparable with

Nikuei et al , 2013. Who reported the most of secondary school education and higher academic educational level. The majority of our women suffered from type 2 diabetes and live in an urban areas. The reported literature documented that Type 2 diabetes is, the most common form of diabetes, with type 1 diabetes accounts for approximately 10% [**Klinke and Toth , 2003**] and stated that the shift from rural to urban dominance leads to sedentary life and less physical exercise [**Boutayeb, 2012**].

In the present study, one fifth of women had unfavorable reproductive profile with obstetric history of spontaneous abortion. Furthermore, most of women underwent cesarean section for previous deliveries. This is supported by **Tenderich, 2012**, who reported that the majority of pregnancies of diabetic women result in cesarean births. Moreover, our results are explained by the reported literature which stated that diabetic women have a high risk and urinary tract infections and premature rupture of membrane as well as 4 folds increased prevalence of macrosomia, that justifies delivery by cesarean section [**Moura et al 2012**].

In an attempt to alleviate maternal and fetal risks of pregnant diabetic women, the current literature stated that preconception evaluation should consist of a thorough history and physical examination in conjunction with laboratory investigations, blood glucose self monitoring, family planning, and achieving a healthy body weight [**Meltzer et al, 1998 ; Klinke and Toth, 2003; Mahmud and Mazza, 2010 and Farahi ,and Zolotor ,2013**] by addressing nutrition, and physical activity [**Paden and Avery, 2012**]. Consequently, the preconception care counseling program in the present study, included specific items such as pregnancy planning, physical examination (blood pressure, ophthalmological and neurological), and laboratory investigations (Hemoglobin A1C, renal function tests),

adjusting blood glucose level, diet control, and practicing exercise. The results of pre-test evaluation of our women showed that the majority of them lack the essential knowledge regarding preconception care and highlighted the need for counseling program discussing the components of main items of the required care. Post-test evaluation (after counseling program), revealed significant improvement of women's knowledge with higher percentages of correct preconception care items mentioned compared to pre-test results. However, the majority of non-responders (women who fails to mention the correct measures and their detailed scores) in post-test sitting, were found to have lower educational levels. A significant positive association between the extent of women's knowledge and their educational level was shown by Kruskal-Wallis test. The median knowledge level was "0" for illiterates, reads and writes, and those who achieved primary school education, whereas the median level was "1" for women with intermediate education and increased to "2" for those with university education denoting the importance of women education in understanding and following preconception care instructions. This is in agreement with Stonecypher, [**Stonecypher,2009**] and **DeCleene et al , 2013** who confirmed that client education is a major component of everyday health care practice.

Conclusions:

The current study finding revealed that about one fifth of our diabetic women had unfavorable reproductive profile with history of spontaneous abortion. The used counseling program resulted in significant improvement of preconception care knowledge among women in the current study. This improvement in knowledge was significantly associated with higher educational level of diabetic women.

References:

Allen VM, Armson BA, Wilson RD, et al.: Teratogenicity associated with pre-existing and gestational diabetes. Society of Obstetricians and Gynecologists of Canada. J Obstet Gynecol Can, 2007; 29:927–944.

American Diabetes Association: Preconception Care of Women With Diabetes. DIABETES CARE, 2003; 26(1): S91-93.

Banhidy F, Acs N, Puho EH, et al. : Congenital abnormalities in the offspring of pregnant women with type 1, type 2 and gestational diabetes mellitus - population-based case-control study. Congenit Anom (Kyoto), 2010; 50:115–121.

Bell R, Bailey K, Cresswell T, et al. : Trends in prevalence and outcomes of pregnancy in women with pre-existing type I and type II diabetes. BJOG, 2008; 115:445–452.

Bell R, Bailey K, Cresswell T, Hawthorne G, Critchley J, Lewis-Barned N, No Diabet Pregnancy Survey S: Trends in prevalence and outcomes of pregnancy in women with pre-existing type I and type II diabetes. BJOGan International Journal of Obstetrics and Gynaecology 2008, 115(4):445-452.

Boutayeb A, Lamlili MEN, Boutayeb W, Maamri A, Ziyyat A, Ramdani N: The rise of diabetes prevalence in the Arab region. Open Journal of Epidemiology, 2012; 2: 55-60.

Bringer J, Fontaine P, Detournay B, Nachit-Ouinekh F, Brami G, Eschwege E: Prevalence of diagnosed type 2 diabetes mellitus in the French general population: The INSTANT study. Diabetes & Metabolism 2009, 35(1):25-31.

Carmody D, Doyle A, Firth R, et al. : Teenage pregnancy in type 1 diabetes mellitus. Pediatr Diabetes, 2009; 11:111–115.

Cheung NW, McElduff A, Ross GP: Type 2 diabetes in pregnancy: a wolf in sheep's clothing. Australian & New Zealand Journal of Obstetrics & Gynaecology 2005, 45(6):479-483.

Danial WW: Biostatistics: A foundation for analysis in the health sciences. 7th edition. NewYork Wily & Sons, 1999.

DeCleene, K E; Ridgway, A J; Bednarski, J; Breeden, L; Mosier, G G; Sachs, D; and Stephenson, D: "Therapists as Educators: the Importance of Client Education in Occupational Therapy," The Open Journal of Occupational Therapy, 2013; 1(4): 1-19.

Farahi N, and Zolotor A: Recommendations for Preconception Counseling and Care. American Family Physician, 2013;88(8):499-506.

Frias JL, Frias JP, Frias PA, et al. 2007. Infrequently studied congenital anomalies as clues to the diagnosis of maternal diabetes mellitus. Am J Med Genet 143A:2904–2909.

Gonzalez-Gonzalez NL, Ramirez O, Mozas J, et al. : Factors influencing pregnancy outcome in women with type 2 versus type 1 diabetes mellitus. Acta Obstet Gynecol Scand, 2008; 87:43–49.

Kitzmiller JL, Wallerstein R, Correa A, and Kwan S: Preconception Care for Women with Diabetes and Prevention of Major Congenital Malformations. Birth Defects Research (Part A), 2010; 88:791–803.

Klinke JA, and Toth EL: Preconception care for women with type 1 diabetes. Can Fam Physician, 2003;49:769-773.

Lisowski LA, Verheijen PM, Copel JA, et al. 2010. Congenital heart disease in pregnancies complicated by maternal diabetes mellitus. An international clinical collaboration, literature review, and meta-analysis. Herz 35:19–26.

Mahmud M, and Mazza D: Preconception care of women with diabetes: a review of current guideline recommendations. BMC Women's Health, 2010; 10:5.

McElduff A, Ross GP, Lagstrom JA, Champion B, Flack JR, Lau SM, Moses RG, Seneratne S, McLean M, Cheung NW: Pregestational diabetes and pregnancy: an Australian experience. Diabetes Care 2005, 28(5):1260-1261.

Meltzer S, Leiter L, Daneman D, Gerstein HC, Lau D, Ludwig S, et al. 1998 clinical practice guidelines for the management of diabetes in Canada. Can Med Assoc J 1998;159.

Moura ERF, Evangelista DR, and Damasceno AKD: The knowledge of women with diabetes mellitus regarding preconception care maternal fetal risks. Rev Esc Enferm USP, 2012; 46(1):22-8.

Nekuei N, Kohan S, and Kazemi A: How to Calculate Sample Size for Different Study Designs in Medical Research? Indian J Psychol Med. 2013; 35(2): 121–126. doi: 10.4103/0253-7176.116232.

Paden MM and Avery DM: Preconception Counseling to Prevent the Complications of Obesity during Pregnancy. American Journal of Clinical Medicine, 2012; 9(1):30-35.

Pearson DW, Kernaghan D, Lee R, et al. 2007. The relationship between pre-pregnancy care and early pregnancy loss, major congenital anomaly or perinatal death in type I diabetes mellitus. Scottish

Diabetes in Pregnancy Study Group. BJOG 114:104–107.

Ray JG, Vermeulen MJ, Meier C, Wyatt PR: Risk of congenital anomalies detected during antenatal serum screening in women with pregestational diabetes. QJM-An International Journal of Medicine 2004, 97(10):651-653.

Shand AW, Bell JC, McElduff A, et al. : Outcomes of pregnancies in women with pregestational diabetes mellitus and gestational diabetes mellitus; a population-based study in New South Wales, Australia, 1998–2002. Diabet Med, 2008; 25:708–715.

Soliman AO: Diabetes Mellitus in Egypt in Short. J Diabetes Metab 2013, 4:10. doi. org/ 10. 4172 /2155-6156.1000318.

Stonecypher, K.: Creating a patient education tool. Journal of Continuing Education in Nursing,2009; 40(10): 462-467.

Tenderich A: C-Sections vs. Natural Birth in Diabetic Moms. Diabetes Mine, 2012.

The Diabetes Control and Complications Trial Research Group: Pregnancy outcomes in the Diabetes Control and Complications Trial. Am J Obstet Gynecol 1996, 174(4):1343-1353.

Tripathi A, Rankin J, Aavold J, et al. 2010. Preconception counseling in women with diabetes: a population-based study in the north of England. Diabetes Care 33:586–588.

Wild S, Roglic G, Green A, Sicree R, King H: Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care 2004, 27(5):1047-1053.