EFFECTS OF NUTRITION TEACHING ON PREGNANCY OUTCOMES IN GESTATIONAL DIABETIC

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Abstract— This one group post experiment design aimed to study pregnancy outcomes in gestational diabetic women after attending group teaching in nutrition at antenatal clinics. The study subjects were ***51*** purposively selected gestational diabetic women (GDM Class A***1*** and GDM Class A***2*** from antenatal clinics, Taksin Hospital. The research tools consist of diabetes knowledge guideline, daily food intake record and food exchange for pregnant women with diabetes and a record of food intake after attending group participatory teaching and demonstration. Each group consisted of ***2-5*** pregnant women with at least three times participation since the first day of abnormal Oral Glucose Tolerance Test (OGTT). Data were collected from January to December ***2014*** and were analyzed by percentage and one group Chi-squire test.
The results showed two normal pregnancy outcomes in gestational diabetic women after attending group participatory teaching and demonstration at antenatal clinics from three criteria variables. They were gestational age (***88.2%)*** and infant birth weight (***70.0%).*** By one group Chi-squire test, the numbers in normal group were higher than the numbers in abnormal group with statistical significance ($p < .01$)***.*** For weight gain during pregnancy, the below normal weight gain group were ***66.7 %*** and higher than the normal weight gain group with statistical significance ($p < .01$)***.***

Keywords— Pregnancy Outcomes, Gestational Diabetic Women, Nutrition.

I. INTRODUCTION

The main goals of maternal and child health care are the healthy mothers and infants. The appropriate practice and health of mothers, such as proper diet and prevention of pre-pregnancy complications, result in normal weight gain during pregnancy, delivery at more than 37 weeks gestation, and 2,500-3,500 gm birth weight newborns.
There are two types of diabetes in pregnant women: pre-gestational diabetes mellitus and gestational diabetes mellitus (GDM). (Chaicharn Deerojanawong, 2007; IDF Clinical Guidelines Task Force, 2009). The prevalence of this medical condition found during pregnancy is 1.4-14% (American Diabetes Association, 2005) and the prevalence in Thailand is 3.7-4.0%. If not properly controlled, GDM can affect health of mothers and newborns. It increases risk of hypertension during pregnancy to 15-20% risk of labour complications such as difficult labour and post-partum hemorrhage, and cesarean section rate. There is 35-50% recurrence rate of GDM in the next pregnancy and 40-60% rate of becoming type2 diabetes in the next 10 years. The newborns of GDM mothers have more abnormalities, perinatal mortality rate, birth injuries from macrosomia and hypoglycemia. (Piyanant Limruengrong, 2013; Titapant, Pimsen, Kannikaklang, Hansiriratanaskul, Wuttiviboonchok, Kongkaew, et al, 2007; Silva, Kaholokula, Ratner, Mau, 2006) At present the Diabetes Association of Thailand (2014) sets practice guideline of pregnant women with GDM for the healthy newborns and mothers without complication. The practice involves inter-disciplinary health team and the patients' cooperation for tight blood sugar control to reduce the complications in mothers and newborns. The proper blood sugar control should be monitored 2-3 months before conception and during pregnancy. (IDF Clinical Guidelines Task Force, 2009) The nurses at antenatal care (ANC) clinics have important roles in nutrition teaching, advice and demonstration for pregnant women with GDM to achieve diet control and correct medication during antenatal period.

The researchers are aware of the need of nutrition teaching for pregnant women with GDM to become the 'routine to research' service at ANC clinic and interested in the pregnancy outcomes of nutrition teaching for pregnant women with GDM at ANC clinic, Taksin Hospital. The research is a routine to research program with one group post-test experiment design. The pregnancy outcomes are measured by gestational age at labor, weight gain during pregnancy and newborn birth weight. The outcomes are direct evidences of nutrition teaching for pregnant women with GDM.

II. METHODS

A. Study design

This research is a routine to research program with one group post-test experiment design. The objectives are to assess the pregnancy outcomes and to analyze the differences of each variable of pregnancy outcomes in pregnant women with GDM who participated in nutrition teaching at ANC clinic, Taksin Hospital. Data were collected from all pregnant women with GDM Class A1 and GDM Class A2 from January to December 2014. All subjects, not limited to gestational age at the first ANC, had at least 3 sessions of participation in nutrition teaching, advice and

demonstration. They were treated and followed by doctors at ANC clinic, Taksin Hospital.

B. Participants

The study population are 70 pregnant women who were diagnosed with GDM and attended ANC clinic, Taksin Hospital in 2014 and 51 samples were purposively selected with the following criteria:

1. Pregnant women with GDM Class A1 and GDM Class A2 with no limitation of gestational age at first ANC
2. No limitation of age, occupation and education level
3. Volunteer to participate in nutrition teaching at ANC clinic

III. MEASUREMENT

The research tools consist of

1.Tools to conduct research

1.1 Guideline of GDM - 8 pages pamphlets containing knowledge of GDM, definition, cause, types of DM, outcomes to mothers and infants, risk factors, screening, diagnosis and self-care practice. They are used for lecture, demonstration and take home instruction.

1.2 Guideline of food and food exchange for GDM - 20 pages pamphlets containing types of food for daily intake, ratio and calories of each type of food, and food exchange. They are used for lecture, demonstration with pictures of measured containers and take home instruction.

1.3 Daily food intake records of breakfast (8.00 am), light meal (10.00 am), lunch (12.00 am), light meal (2.00 pm), dinner (6.00 pm) and light meal before bed (8.00 pm). The subjects bring the records to the research to calculate food calories

2. Tools for data collection from ANC and labor records. They consist of name, age, height, BMI before pregnancy, number of attendance, result of first 50 gm OGTT and 100 gm OGTT, type of GDM, gestational age at labor (weeks), weight gain during pregnancy and newborn birth weight.

The researcher team conducted the experiment and collected data from pregnant woman with GDM at ANC clinic. After the blood test results were known, the subjects participated in group teachings of nutrition in GDM with lecture, demonstration and back demonstration. Each group consisted of 2-5 subjects and attended at least 3 sessions.

Session 1 week 1 after blood test result:

1) Lecture on diabetes in pregnancy, definition, cause, types of DM, outcomes to mothers and infants, risk factors, screening, diagnosis and self-care practice. The subjects were handed with Guideline of GDM and Guideline of food and food exchange for GDM after lecture to read at home. They were motivated by the benefits of medication and diet control during pregnancy. The lecturer emphasized the mothers' potential for safe fetus and prevention of pregnancy complication.

2) Lecture, demonstration and back demonstration for:

- Nutrition in GDM. The contents included the importance of diet control in DM, types of food, proper amount of each meal, how to choose the right food to control blood sugar and body weight, carbohydrate ratio and exchange in each meal, distribution for main meals and light meals, daily calorie intake and calorie calculation. They practiced calorie calculation for daily 32 kcal per kg of ideal body weight in the first trimester and increased to 38 kcal per kg of ideal body weight in the second and third trimester. Foods consist of 50-55% carbohydrate, 20% protein and 25-30% fat. Minimal daily requirement of carbohydrate is 200 gm. There should be one light meal before bed. The meal distribution should be breakfast (8.00 am), light meal (10.00 am), lunch (12.00 am), light meal (2.00 pm), dinner (6.00 pm) and light meal before bed (8.00 pm).

- Demonstration for food exchange selection, calorie calculation of each type of food, food amount from measured containers and pictures.

- Demonstration for meals, types of proper daily food intake in main meals and light meals, and instruction for daily food intake records at home.

- Demonstration for food selection, food in nutrition flag, how to buy fresh food and prepared food, food menu, food choice based on color zones, and practice for energy expenditure. The teaching media were a) real foods, i.e. rice, milk and virtual pictures b) food models, i.e. mackerel fish, pork, banana, pumpkin, tangerine, longan, guava, water melon and pictures c) measured containers, i.e. ladle, spoon, measured cup, glass and others.

3) Self-care practice by applying knowledge from 1) and 2). The subjects recorded daily food intakes for number of meals and amount measured by measured containers. They took the records to the nurses at next ANC visit to assess the properness of their food intakes.

4) Seeing doctors for treatment at routine ANC.

Session 2 week 2 and next session at ANC visit

- Individual assessment of daily food amount and calorie intakes during previous week from daily food intake records at home to calculate calorie comparing with weight gain and feedback.

-Teaching from Session 1 was reviewed by questions, knowledge exchange, problems and answers to raise awareness of pregnant women with GDM. They were told the benefits of medication and diet control during pregnancy with emphasis on the mothers' potentials and intentions.

- Assessment of weight gain and complications by maternal and fetal health assessment at ANC. Further instruction and demonstration in case of incorrect food intakes.

Last week post delivery

The researcher team collected individual data of pregnant women with GDM, pregnancy outcomes, i.e. mother weight gain, gestational age at labor and newborn birth weights.

IV. DATA ANALYSIS

1. General data of pregnant women with GDM who participated in nutrition teaching at ANC clinic were analyzed by percentages, means and standard deviation.

2. Data of pregnancy outcomes were analyzed by percentages and differences of each variable, i.e. gestational age at labor, weight gain during pregnancy and newborn birth weights were analyzed by percentages and χ^2 –test from one group

V. RESULTS

1. General data of pregnant women with GDM who participated in nutrition teaching at ANC clinic, Taksin Hospital: 60.80% were 20-35 years old, 88.20% had normal height of $\geq$ 150 cm., 56.90 % had normal BMI of 18.60-24.90 kg/m^2 before pregnancy, 51.00% participated in at least 3 sessions of group nutritional teaching, 56.90% had first visit 50 gm OGGT of 181-220 gm/dl, 70.60% were GDM class A1, 60.80% were delivered by cesarean section. (Table 1)

Table 1: Numbers and percentages of pregnant women with GDM who participated in nutrition teaching at ANC clinic, Taksin Hospital (n=51)

Data		n	%
Age	20-35 yr (normal)	31	60.8
	>35 yr	20	39.2
Height	<150 cm	6	11.8
	>150 cm (normal)	45	88.2
BMI before pregnancy			
	WHO criteria (kg/m^2)		
	<18.5 (below)	2	3.9
	18.6-24.9 (normal)	29	56.9
	25-29.9 (above)	12	23.5
	>=30 (obese)	8	15.7
Numbers of sessions participated			
	<4	8	15.7
	4-6	26	51.0
	>6	27	33.3
50 gm OGGT at first visit			
	140-180 gm/dl (low)	20	39.2
	181-220 gm/dl (high)	29	56.9
	<220 gm/dl (very high)	2	3.9
Type of GDM			
	GDM Class A1	36	70.6
	GDM Class A2	15	29.4
Type of delivery			
	Normal labor	20	39.2
	Cesarean section	31	60.8

Table 2: Numbers, percentages and hypothesis test for differences of variables of pregnancy outcomes in pregnant women with GDM who participated in nutrition teaching at ANC clinic, Taksin Hospital using χ^2-test for one group

Variables	Mean	SD	n	%	χ^2-test
Gestational age at labor (weeks)	38	1.73			
32-36 (below)			6	11.8	69.84**
37-41 (normal)			45	88.2	
Weight gain during pregnancy	9.5	.93			
<10 kg (below)			34	66.7	
10 – 16 kg (normal)			8	15.7	25.52**
>16 kg (above)			9	17.6	
Newborn birth weight (gm)	2,966	658			
<2,500 gm (below)			5	10	
2,500-3,000 gm (normal)			35	70	31.00**
>3,000 gm (above)			10	20	

****Differences of variables of pregnancy outcomes with statistical significance (p<.01)**

DISCUSSION & CONCLUSION

1. Pregnancy outcomes in pregnant women with GDM who participated in nutrition teaching at ANC clinic, Taksin Hospital were normal in 2 from 3 variables. There were more normal gestational age at labor (88.2%) and more normal newborn birth weight (70.0%) with statistically significant differences (p<.01). These effects should indicate the effectiveness of routine nutrition teaching for pregnant women with GDM at ANC clinic. It was the continuous routine care from the time of abnormal OGTT results until delivery. Pregnant women with GDM learned details of DM and self-care practice. The teaching consisted of lecture, demonstration and back demonstration with teaching media, such as real foods, virtual pictures, measured containers, guideline of GDM, guideline of diets for GDM and food exchange for further reading at home. There were motivation, demonstration and back demonstration for choice of food exchange, food calorie calculation, numbers of main and light meals and types of food intake. The subjects were advised to fill daily food intake record at home and to bring them to the nurses at next ANC visit for assessment. They were then treated by doctors for routine ANC. After one year of teaching in this project, the researcher team have raised awareness for self-care practice in pregnant women with GDM. Self-care practice is important in promotion and prevention of complications from GDM. (Angsinant Intarakamhang, 2009) The practice is in compliance with clinical practice guideline for management of pregnant women with GDM by diet

control, exercise and insulin for DM Class A2. The pregnant women with GDM were advised to avoid simple sugar, limit the food calories not exceeding 32 kcal/kg of ideal body weight/day in the first trimester and increase to 38 kcal/kg of ideal body weight/day in the second and third trimester. Foods consist of 50-55% carbohydrate, 20% protein and 25-30% fat. Minimal daily requirement of carbohydrate is 200 gm. There should be one light meal before bed and meal distribution throughout the day. (IDF Clinical Guidelines Task Force, 2009; Diabetes Association of Thailand, 2014) Most pregnant women with GDM who participated in nutrition teaching and demonstration from the researcher team could control their blood sugar. The pregnancy outcomes were more normal gestational age at labor and more normal newborn birth weight with statistical significance ($p<.01$). The result is similar to Chalermporn Titpard and Pannee Titpard (2012) who studied the program of eating behavior promotion in pregnant women and weight gain during pregnancy at a tertiary hospital, Konkaen Province. They found that, after labor, the mothers who participated the program had normal weight gain (75.76%) more than the mothers who did not participate (39.39%) with statistically significant ratio of normal weight gain.

2. Pregnancy outcome of weight gain during pregnancy in pregnant women with GDM showed 66.70% of the subjects had weight gain below normal (10 kg) with statistical significance ($p< .01$, mean = 9.50 kg, SD = 5.93 kg). The slight weight of 0.50 kg below normal weight gain might result from the program of nutrition teaching, demonstration, back demonstration, assessment from daily food intake record and repeated advice from the nurses that caused the mothers' intention to correct food intakes until they had inadequate intakes. The outcome might be related to the amount and ratio of daily food intakes in each trimester of pregnancy. The pregnant women who ate high calorie diet in the last trimester had less risk of below normal weight gain while food intakes during early pregnancy did not have effects on weight gain during pregnancy. (Tripop Lertbunpong, 2008) This could explain that weight gain during pregnancy depended on the amount and ratio of food intakes in each trimester of pregnancy. This research assessed total weight gain during pregnancy, not by each trimester. It is not in compliance with Nualpan Eamtrakul (2003) who studied the program of changing health behavior with 3 self in pregnant women with DM risks at Lertsin Hospital. The program consisted of knowledge sharing in eating, exercise and self-care practice during pregnancy. The result showed that 96% of the pregnant women with DM risks who participated the program had normal weight gain (12-15kg).

RESEARCH SUGGESTION

The innovation model should be developed by experiment and continuous assessment. There should be more sample size, such as 100 samples for 2 years experiment, to make more reliable results. The guidelines with teaching media and full contents should be published.

ACKNOWLEDGMENT

The author would like to thank the research and development institute, Suan Sunandha Rajabhat University, Bangkok, Thailand for financial support.

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