



Pregnancy outcomes in pregnant women with previous history of gestational diabetes

Masomeh Rezaie¹, Mahbobeh Azimi², Ezatollah Rahimi³ and Farnaz Zand Vakili^{4*}

¹Assistant Professor, Department of Obstetrics and Gynecology, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

²Department of Obstetrics and Gynecology, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

³Assistant Professor, Department of Internal Medicine, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

⁴Assistant Professor, Department of Obstetrics and Gynecology, Faculty of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

*Corresponding Email: fzandv@gmail.com

ABSTRACT

The aim of this study was to determine the pregnancy outcomes in pregnant women with a history of previous gestational diabetes and its related recurrence risk factors. This study was conducted on 180 pregnant women with history of gestational diabetes in previous pregnancy that referred to Besat hospital, Sanandaj, Iran. They were divided into two groups (recurrence of gestational diabetes group and non-recurrence of gestational diabetes group). The data were recorded in the check list and analyzed using SPSS software Ver.18. To analyze quantitative variables such as mother's age, mother's BMI, interval between pregnancies, Apgar score and neonatal hypoglycemia independent t-tests was used and to compare qualitative variables between the two groups chi square test was used. The results showed that there was no statistically significant difference between the two groups in terms of mother's age ($P = 0.22$). In terms of mother's BMI and interval between pregnancies there was statistically significant difference between the two groups ($p < 0.05$). In terms of mode of delivery, after excluding 61 mothers who were replicate Cesarean section the percentage of Caesarean section in recurrence of gestational diabetes group was 15.4% and in non-recurrence of gestational diabetes group it was 2.4% which difference was statistically significant ($P < 0.05$). In terms of incidence of macrosomia ($P < 0.001$) and neonatal hypoglycemia ($p < 0.05$) there were statistically significant differences between two groups. The recurrence rate of diabetes was 66.6%. Regarding the results of this study in order to prevent maternal and fetal complications, monitoring and giving extra care to mothers with diabetes is recommended.

Key words: Pregnancy outcome, gestational diabetes, risk factors

INTRODUCTION

Gestational diabetes is defined as any degree of glucose intolerance with onset or first recognition during pregnancy [1]. Incidence of gestational diabetes is 3-5% of all live births which is now increasing due to the rise in obesity and gestational age [2]. Asian and African women compared with white women are at higher risk for gestational diabetes [3]. Women with gestational diabetes are more likely to experience obesity, dyslipidemia, and hypertension in later life than women who have not had gestational diabetes [4]. Also they are more likely to suffer preeclampsia, operative delivery and stillbirth [5], and infants are at higher risk of preterm delivery and macrosomia, which is

associated with birth injury, respiratory distress and neonatal hypoglycaemia [6]. Women with gestational diabetes have a 41 % recurrence rate of developing gestational diabetes in subsequent pregnancies [7]. The frequency of recurrent gestational diabetes varies from 30 to 84%, depending on the ethnicity and the diagnostic criteria used [8]. Risk factors associated with recurrence of gestational diabetes have also varied among reported studies. In general, greater maternal age, obesity, degree of hyperglycemia in the index pregnancy, increased weight gain, and short interval between pregnancies were suggested to be associated with recurrent gestational diabetes [8-9]. Previous studies showed that screening, detection, and treating gestational diabetes can significantly reduce maternal, fetal, and neonatal morbidities [10].

The OGCT (50 g 1-h) remains the main screening method for gestational diabetes as recommended by the American Diabetic Association (ADA), and American College of Obstetrician and Gynecologists [11]. In obese women, the risk of impaired glucose tolerance in further pregnancies is high. Changes in lifestyle, including weight control and exercise between pregnancies may prevent gestational diabetes recurrence and decrease the onset and severity of type II diabetes in the future [12]. Gestational diabetes complications occur in 40% of mothers with gestational diabetes. Diagnosis and treatment of gestational diabetes has a significant role to decrease the risk of adverse prenatal outcomes [12].

Fetal death rate in well treated cases of gestational diabetes has no different than the general population. The concern that arises during prenatal period is the fetus overgrowth which may lead to birth trauma for both the mother and the fetus [13]. The treatment of gestational diabetes reduces the risks of fetal overgrowth, shoulder dystocia, cesarean delivery, and hypertensive disorders [14].

Previous studies have reported recurrent gestational diabetes in subsequent pregnancies as 30-84 percent [7, 8, 13]. This figure varies according to different studies and risk of diabetes in subsequent pregnancies still cannot accurately be determined [13].

Previous studies have indicated that race, age, parity, family history of diabetes, pre-pregnancy weight and MBI. Previous baby weight, postpartum obesity, and weight gain are risk factors for developing gestational diabetes [15,16]. Other suspected risk factors include smoking, physical inactivity, diet, and drugs that adversely affect glucose metabolism [17]. Among these risk factors pre-pregnancy MBI, previous baby weight are considered more than others and could possibly be used in predicting gestational diabetes in a subsequent pregnancy [18].

The aim of this study was to determine the recurrence rate of gestational diabetes and investigating prenatal outcomes in patients with recurrent gestational diabetes and also Identifying risk factors for recurrence of gestational diabetes.

MATERIALS AND METHODS

This cohort study was conducted on 180 pregnant women with history of gestational diabetes in previous pregnancy that referred to Besat hospital, Sanandaj, Iran. They were divided into two groups based on recurrence of gestational diabetes, namely recurrence of gestational diabetes group and non-recurrence of gestational diabetes group. Inclusion criteria included women with gestational diabetes in previous pregnancy and exclusion criteria were included; overt diabetes, high fasting blood glucose in the first trimester of pregnancy, repeated abortions, autoimmune diseases, chronic hypertension and other chronic diseases. Considering the prevalence of gestational diabetes as 3-5% (2), 35-40% of recurrent gestational diabetes [7], Type I error as 5% and Type II error as 20%, therefore, a minimum sample size of 60 patients in each group was calculated. In non-recurrence of gestational diabetes group 60 patients and in recurrence of gestational diabetes group in order to increase the power of study 120 patients were evaluated. Finally total of 180 pregnant women with history of gestational diabetes were evaluated and followed up to delivery.

In the time of delivery, according to studied variables necessary data such as mother`s height and weight, mother`s blood pressure, delivery mode, birth weight and neonatal hypoglycemia were measured and recorded in the check list.

In this study macrosomia was defined as weighing more than 4000 grams, neonatal hypoglycemia as baby's blood sugar (glucose) less than 45 mg per dL for term infants, and less than 35 mg per dL for term infants. Gestational

diabetes screening was performed between 24 and 28 weeks' gestation using a 50 g, 1-hour glucose load test, with plasma glucose values ≥ 140 mg/dL considered screen-positive. Diagnostic testing was offered to these women and performed using a 100 g, 3-hour oral glucose tolerance test (OGTT).

Data were analyzed using SPSS ver.18. To compare variables such as maternal age, BMI and the interval between pregnancies, Apgar and neonatal hypoglycemia of the two groups, independent t- test and to compare qualitative variables between the two groups Chi2 test was used.

RESULTS

The results showed that the recurrence rate of gestational diabetes was 66.6%. Mean age in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 31.5 ± 4.43 and 30.62 ± 4.90 respectively, there was no significant differences between the two groups statistically ($p=0.22$). Mean BMI in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 31.5 ± 4.43 and 25 ± 2.82 respectively, there was significant differences between the two groups statistically ($p < 0.001$). Mean interval between pregnancies in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 6.16 ± 2.59 years and 5.25 ± 2.43 years respectively, there was significant differences between the two groups statistically ($p < 0.05$) (Table 1).

In terms of preterm labor and preeclampsia and admitted to the NICU, there was no significant difference between the two groups. In terms of labor mode the Cesarean section rate in recurrence of gestational diabetes group was 15.4% and in non-recurrence of gestational diabetes group it was 2.4% that there was significant difference between the two groups statistically ($p=0.03$). Also regarding neonatal hypoglycemia ($RR = 3.12: 1.14-8.57, P < 0.05$) and the incidence of macrosomia ($RR=3.00:1.11-9.78, p < 0.05$) there were significant difference statistically between the two groups. (Table 2)

Table 1. Comparing mean quantitative characteristics of mothers and infants in the two groups

Characteristics	Group	Frequency	Mean & SD	T	P Value
Age (Year)	Recurrence	120	31.51 ± 4.43	1.22	0.22
	Non- recurrence	60	30.62 ± 4.95		
BMI	Recurrence	120	28.15 ± 3.58	5.94	0.000
	Non- recurrence	60	25.00 ± 2.82		
interval between pregnancies (Year)	Recurrence	120	6.16 ± 2.59	2.26	0.025
	Non- recurrence	60	5.25 ± 2.43		
Apgar Score	Recurrence	120	8.43 ± 0.74	1.30	0.19
	Non- recurrence	60	8.58 ± 0.69		

Table 2. Comparing mean qualitative characteristics of mothers and infants in the two groups

Characteristics		Yes No. (%)	No No. (%)	Total No. (%)	P
Preterm labor	Recurrence	8 (6.7)	112 (93.3)	120 (100)	0.68
	Non- recurrence	5 (8.3)	55 (91.7)	60 (100)	
preeclampsia	Recurrence	14 (11.7)	106 (88.3)	120 (100)	0.49
	Non- recurrence	5 (8.3)	55 (91.7)	60 (100)	
Delivery Mode*	Recurrence	12 (15.4)	66 (84.6)	78 (100)	0.03
	Non- recurrence	1 (2.4)	40 (97.6)	41 (100)	
Macrosomia	Recurrence	18 (15.00)	102 (85.00)	120 (100)	0.049
	Non- recurrence	3 (5.00)	57 (95.00)	60 (100)	
Hypoglycemia	Recurrence	25 (20.8)	95 (79.2)	120 (100)	0.015
	Non- recurrence	4 (6.7)	56 (93.3)	60 (100)	
Admitted to the NICU	Recurrence	6 (5.00)	114 (95.00)	120 (100)	0.061
	Non- recurrence	2 (3.3)	58 (96.7)	60 (100)	

*61 women who had repeat cesarean delivery were excluded from this comparison

DISCUSSION

Diabetes is the most common medical complication during pregnancy and in case of leave untreated can lead to fetal and maternal complications [19]. The recurrence rate of diabetes in our study was 66.6%. In a study by Kwak et al the recurrence rate of diabetes in Korean women was reported as 45%. Kim in a review study have reported that recurrence rates varied between 30 and 84%. Lower rates is for non-Hispanic white populations (30-37%), and higher rates for minority populations (52-69%) [8]. Mohammad-Beigi et al have reported the recurrence rate of diabetes as 72.4% [20]. Our finding is close to the maximum rate because Asian and African women compared with white women are at higher risk for gestational diabetes [3] and our study is conducted in Iran which is an Asian country. Kim in a systematic review pointed out to risk factors such as maternal age, parity, BMI, oral glucose tolerance test levels, and insulin use that inconsistently predicted development of recurrent of gestational diabetes [8].

In present study mean BMI in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 31.5 ± 4.43 and 25 ± 2.82 respectively, there was significant differences between the two groups statistically ($p < 0.001$). It can be said that BMI is a risk factor for gestational diabetes in our population. Choi also indicated that among Korean women, prepregnancy BMI is a risk factor for gestational diabetes [21]. Regardless of gestational weight gain, women with obese pre pregnancy BMI had increased odds of gestational diabetes compared to women with normal pre pregnancy BMI [22]. Our finding is in consistent with previous studies [23, 24]. We can say that obesity is a significant factor in prevalence and recurrence of gestational diabetes in subsequent pregnancies. Therefore, weight control before pregnancy can play a significant role in preventing the recurrence of diabetes and its complications.

In present study mean age in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 31.5 ± 4.43 and 30.62 ± 4.90 respectively, although there was no significant differences between the two groups statistically ($p = 0.22$), but gestational age is among potential causes of gestational diabetes [25]. In a study by Hedderson risk factors of gestational diabetes were including age and pre-pregnancy BMI [26]. Preconception care of reproductive aged women is as important as prenatal care to lower the risk of gestational hypertension, gestational diabetes, preterm labor, and SGA and LGA infants [22].

In our study mean interval between pregnancies in recurrence of gestational diabetes group and non-recurrence of gestational diabetes group were 6.16 ± 2.59 years and 5.25 ± 2.43 years respectively, there was significant differences between the two groups statistically ($p < 0.05$). In previous studies that have examined this variable differences were significant [8, 10, 17]. Kim has mentioned this factor as one of the predictors of recurrence of diabetes [8]. Bryant and Madden in a study have concluded that an interpregnancy interval of shorter than 18 months is associated with a reduction in the odds of a diagnosis of gestational diabetes in the second pregnancy [27]. In a study by Major a shorter interval ($< \text{or} = 24$ months) between pregnancies was determined as most significant risk factor for a recurrence of gestational diabetes [28].

In present study there was no significant difference between the two groups statistically in terms of preterm labor ($p = 0.68$). In a study by Kock et al women with diabetes mellitus tended significantly more often to preterm births ($P = 0.002$). Also a significant difference in the incidence of spontaneous preterm birth was found ($P = 0.047$). They concluded that the length of gestation and incidence of spontaneous preterm birth are affected by diabetes mellitus [29]. Lao and Ho in a study confirmed that gestational glucose intolerance affects gestation length and incidence of preterm birth, which should be considered as a confounding factor in neonatal outcomes of gestational diabetes pregnancies [30]. Early diagnosis of gestational diabetes could avoid some diabetes-related complications such as preterm births [31]. Therefore screening pregnant women diagnosed as having gestational diabetes is recommended.

In our study there was no significant difference between the two groups in terms of preeclampsia ($p = 0.49$). Yogev et al in a study determined that 10% of gestational diabetes patients developed preeclampsia. They concluded that higher blood pressure early in pregnancy, even prior to gestational diabetes diagnosis is associated with the subsequent development of preeclampsia [32].

In the case of delivery mode in the present study there were 66 NVD cases and 54 cases of caesarean sections in the recurrence of gestational diabetes group. Of performed caesarean sections 42 cases were repeated caesarean section

and 14 cases were performed because of fetal reasons; thick meconium 4 cases, lack of labor progress 3 cases, large fetus 1 case, IUGR 1 case, twins 1 case, breech presentation 1 case and fetal arrhythmia 1 case.

In the non-recurrence of gestational diabetes group there were 40 NVD cases and 20 cases of caesarean sections. 19 cases were repeated caesarean sections and 1 case was breech presentation. Considering that from 94 performed caesarean sections in both groups, 61 cases were repeated, therefore they were excluded from comparison. The Caesarean section rate in recurrence of gestational diabetes group was 15.4% and in non-recurrence of gestational diabetes group was 2.4% that there was significant difference between the two groups statistically ($p=0.03$). This finding was consistent with previous studies [7, 10, 33,] and show a high rate of caesarean section in recurrence group because of fetal complications such as macrosomia, fetal distress and the lack of progress in labor. This again emphasizes mother's weight control to prevent the recurrence of gestational diabetes.

In the present study there was significant difference statistically between the two groups in terms of macrosomia ($p<0.05$). This finding was consistent with previous studies [8, 13, 19]. It can be said that macrosomia is among gestational diabetes complications that led to shoulder dystocia and brachial plexus harm and also increased rates of caesarean sections due to the lack of labor progress [19].

In this study there was significant difference statistically between the two groups in terms of neonatal hypoglycemia ($P < 0.05$). This finding was consistent with previous studies [13, 20].

CONCLUSION

According to the results of this study one of the important factors involved in the recurrence of gestational diabetes is pre pregnancy BMI. Torioni also in a study concluded that the risk of gestational diabetes is positively associated with pre pregnancy BMI [34]. Pre-pregnancy weight control has an important role in reducing the recurrence of gestational diabetes. Screening and counseling women planning a pregnancy is recommended.

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