

Analysis of Perinatal Outcome of Normal Pregnant Women with Diabetes Mellitus

Sitong Lin

Yushan Guo

Sitong Lin Department of Endocrinology, Affiliated Hospital of BeiHua University, Jilin, PR China, Yushan Guo* Department of Endocrinology, Affiliated Hospital of BeiHua University, Jilin, PR China, *Correspondence author: Yushan Guo, email: guoys135962@163.com

Objective:The perinatal outcome of normal pregnant women with gestational diabetes mellitus was analyzed. **Methods:** The subjects were 50 pregnant women admitted to our hospital from September 2018 to 2019. According to the control of blood glucose level, they were divided into two groups: group A and group B. 32 pregnant women in group A had ideal control of blood glucose and 18 in group B had unsatisfactory control of blood glucose. The adverse pregnancy outcome, comparison of blood lipid and lipoprotein, quality of life score, perinatal complications and other relevant conditions were observed. **Result:** The adverse pregnancy outcome of group A was significantly lower than that of group B ($P < 0.05$); the lipid and lipid protein of group A was significantly better than that of group B ($P < 0.05$); the quality-of-life score of group A was significantly better than that of group B ($P < 0.05$); the perinatal complications of group A was significantly lower than that of group B ($P < 0.05$). **Conclusion:** The control of blood bottle level of pregnant women with gestational diabetes mellitus is beneficial to the perinatal outcome, reduce the incidence of complications of pregnant women and newborns, and significantly improve the quality of life of pregnant women.

Keywords: Blood glucose level; Normal pregnancy; Diabetic pregnant women; Perinatal outcome

Tob Regul Sci.™ 2021;7(5): 1378-1382

DOI: doi.org/10.18001/TRS.7.5.56

Pregnant women with gestational diabetes have two conditions. One is that they have been diagnosed with diabetes before pregnancy, which is called "diabetes mellitus with pregnancy". The other is that they have normal glucose metabolism before pregnancy or are diagnosed with diabetes due to potential impaired glucose tolerance or during pregnancy, which is also called "gestational diabetes". More than 80% of diabetic pregnant women are gestational diabetes, and the remaining 20% are diabetes mellitus with pregnancy. According to the reports of the world, the incidence of gestational diabetes is about 1% to 14%, while the incidence of gestational diabetes in China is about 1% to 5%. There are many factors that cause gestational diabetes, many of which are related to other types of diabetes, and many of which are related to heritage factors. One of the factors that cause gestational diabetes is that the life habits of pregnant women are not correct, resulting in high blood sugar content. With the change of

life style, the incidence of type 2 diabetes tends to be younger, and the other side is Many pregnant women eat more and have fewer activities, which is also the cause of gestational diabetes. There are also obesity factors, family history of diabetes, adverse obstetric history, age factors and so on. Most patients with gestational diabetes can return to normal glucose metabolism after childbirth, but the chance of type II diabetes will increase in the future^{1,2}. The clinical course of diabetic pregnant women is complex, so we should pay attention to the risk of mother and child.

DATA AND METHODS

General information

The subjects were 50 pregnant women admitted to our hospital from September 2018 to 2019. According to the control of blood glucose level, they were divided into two groups: group A and group B. 32 pregnant women with ideal blood glucose control were in group A, and 18 pregnant

women with unsatisfactory blood glucose control were in group B. all pregnant women were in their first trimester, with no history of glycosis and other complications before pregnancy, and the average age was (27.36 ± 3.14) years old, with an average gestational age of (36 ± 6.1) weeks, all the patients signed the informed consent voluntarily without quitting. There was no significant difference between the two groups ($P > 0.05$).

Method

Diagnostic criteria for gestational diabetes: three kinds of laboratory tests and diagnoses: (1) The fasting blood glucose of pregnant women is measured, and the fasting blood glucose of pregnant women with two or more times of pregnancy is $\geq 5.8\text{mmol/l}$, then it can be diagnosed as gestational diabetes; (2) The glucose screening test, the pregnant women carry out GDM screening from 24 to 28 weeks of pregnancy, the specific methods are as follows: 50g glucose powder dissolves in Wenkai In 200ml of water, take it within 5 minutes, and measure the blood glucose one hour later. If the blood glucose is more than 7.8mmol/l , the result will be positive. In this case, the pregnant women should be instructed to check the fasting blood glucose again. If the result of the fasting blood glucose is abnormal, it will be judged as gestational diabetes; if the result of the fasting blood glucose is normal, then the glucose tolerance test is needed again; (3) OGTT: pregnant women take 75g glucose orally after 12 hours of fasting. The normal standard of blood glucose content is the upper limit of fasting blood glucose content of 5.6mmol/l . After one hour of oral administration, the blood glucose is 10.3mmol/l . After two hours of oral administration, the blood glucose is 8.6mmol/l . After three hours of oral administration, the blood glucose is 6.7mmol/l . If two or more of the examination results are above the normal value, it can be diagnosed as gestational diabetes. If only one of the examination results is above the normal value, it can be regarded as abnormal glucose tolerance³.

Enzyme method has the advantages of simple operation, sensitivity, precision and relative specificity. It is suitable for automatic analysis. At present, all clinical trials in China are using the conventional method. Generally, glycerophosphate oxidase peroxidase-4-aminoantipyrine and phenol method are recommended for the determination of

triglyceride and total cholesterol in serum. For the determination of serum high density lipoprotein cholesterol, it is recommended to directly use phase determination method in clinical laboratory at present, mainly including clearance method, PEG modified enzyme method, selective inhibition method and immunoseparation method⁵.

Observation indicators

The adverse outcome of pregnancy, the comparison of blood lipid and blood lipid protein, the quality of life of pregnant women and the complications of perinatal were observed and evaluated.

(1) Evaluation of adverse outcomes of pregnancy: observe the adverse conditions of pregnancy, amniotic fluid, infection, postpartum hemorrhage and cesarean section between the two groups.

(2) Evaluation of blood lipid and blood lipid protein: the blood lipid level was measured by enzyme method. Two groups of pregnant women from 20 to 36 weeks were divided into two groups for blood lipid examination. The blood lipid level was measured by hitch75 automatic biochemical analyzer to understand the levels of total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, triglyceride, apolipoprotein A1 and apolipoprotein B⁵.

(3) Evaluation of pregnant women's quality of life: observe the physiological function, health status, mental health, energy and physiological function of the two groups of pregnant women and score them with a full score of 100. The higher the score, the better the quality of life of pregnant women⁶.

(4) Evaluation of perinatal complications in the two groups: compare the incidence of hypoglycemia, low weight, respiratory distress, macrosomia, hypoglycemia and other complications in the two groups.

Statistical methods

Spss21.0 analysis was used. The measurement data were expressed in $(\bar{x} \pm s)$, t test and X2 test respectively. The difference was statistically significant ($P < 0.05$).

Comparison of blood lipid and blood lipid protein levels between two groups of pregnant women

The level of blood lipid and lipoprotein in group A was significantly higher than that in group B ($P < 0.05$), as shown in Table 2.

RESULTS

Comparison of adverse pregnancy outcomes between the two groups

The adverse pregnancy outcome of group A was significantly lower than that of group B ($P < 0.05$), as shown in Table 1.

Table 1. Comparison of adverse pregnancy outcomes between the two groups [n (%)]						
Group	Number of cases	Pregnancy high	Amniotic fluid	Infected	Postpartum hemorrhage	Cesarean section
Group A	32	5 (14.71)	1 (3.13)	1 (3.13)	0 (0.00)	13 (40.63)
Group B	18	10 (55.56)	4 (22.22)	3 (16.67)	1 (5.56)	13 (72.22)
χ^2		36.610	16.463	10.177	5.719	20.294
P		0.000	0.000	0.001	0.017	0.000

Table 2. Comparison of blood lipid and blood lipid protein levels between the two groups							
Group	Number of cases	TG (mmol/L)	TC (mmol/L)	HDL-C (mmol/L)	LDL-C (mmol/L)	Apolipoprotein AL (mmol/L)	Apolipoprotein B (mmol/L)
Group A	32	2.47±0.68	4.19±1.36	5.21±0.37	2.69±0.76	1.53±0.34	1.66±0.53
Group B	18	4.41±1.63	5.04±1.41	1.75±0.39	3.36±0.63	1.21±0.36	0.85±0.64
t		5.914	2.094	31.133	3.173	3.128	4.812
P		0.000	0.042	0.000	0.003	0.003	0.000

Comparison of quality of life between two groups of pregnant women significantly better than that of group B ($P < 0.05$), as shown in Table 3.

The quality-of-life score of group A was

Table 3. Comparison of QOL scores between two groups ($\bar{x} \pm s$)						
Group	Number of cases	Physiological function (minutes)	Health status (minutes)	Mental health (minutes)	Energy (minutes)	Physiological function (minutes)
Group A	32	63.45±22.31	75.36±23.61	74.12±12.51	78.36±14.36	83.54±23.51
Group B	18	51.04±16.78	62.03±17.54	65.36±17.63	64.06±17.51	70.01±20.33
t		2.052	2.089	2.046	3.122	2.047
P		0.046	0.042	0.046	0.003	0.046

Comparison of perinatal complications between the two groups significantly lower than those in group B ($P < 0.05$), as shown in Table 4.

The perinatal complications in group A were

Table 4. Comparison of perinatal complications between the two groups [n (%)]							
Group	Number of cases	Hypoglycemia	Low birth weight infant	Respiratory distress	Macrosomia	Neonatal hypoglycemia	Complication rate
Group A	32	2 (6.25)	1 (3.13)	1 (3.13)	0 (0.00)	2 (6.25)	6 (19.12)
Group B	18	2 (11.11)	2 (11.11)	3 (16.67)	2 (11.11)	4 (22.22)	13 (72.22)
χ^2		1.490	4.815	10.277	11.764	10.445	56.818
P		0.222	0.028	0.001	0.001	0.001	0.000

DISCUSSION

At present, it is recognized that the main risk factor of gestational diabetes is older pregnancy. The risk of gestational diabetes in pregnant women

aged 40 and above is 8.2 times higher than that in pregnant women aged 20-30. The older the pregnant women are, the smaller the gestational age of gestational diabetes diagnosis ⁷. In the first and

second trimester of pregnancy. With the increase of gestational age, the demand for nutrients will increase, and the main source of fetal energy is to obtain glucose from the mother through the placenta. The plasma glucose level of pregnant women decreased with the progress of pregnancy, and the fasting blood glucose decreased by about 10%. The causes of gestational diabetes are as follows: the increase of the amount of glucose obtained by the fetus from the mother; the increase of plasma flow and glomerular filtration rate during pregnancy, but the reabsorption rate of glucose by renal tubules cannot be increased correspondingly, which results in the increase of the amount of glucose excreted by some pregnant women; the increase of the utilization of glucose by the mother by estrogen and progesterone. As a result, the ability of pregnant women to clear glucose on an empty stomach is enhanced compared with that of non-pregnant women. The fasting blood glucose of pregnant women is lower than that of non-pregnant women, which is also the pathological basis for the occurrence of hypoglycemia and ketoacidosis. During the second and third trimester of pregnancy, the anti-insulin like substances in pregnant women increased, such as placental lactogen, estrogen, progesterone, cortisol and placental insulin enzyme, the sensitivity of pregnant women to insulin decreased with the increase of gestational age. Therefore, to maintain the normal level of glucose metabolism, the demand for insulin must increase accordingly. When the physiological change cannot be compensated during pregnancy, the pregnant women with limited insulin secretion will increase the blood sugar, aggravate the original diabetes or have gestational diabetes^{8,9}. The influence of pregnancy on diabetes: ①To make the invisible diabetes dominant; ②To make the pregnant women without diabetes have gestational diabetes; ③To make the condition of diabetic patients worse. The fasting blood glucose of pregnant women is relatively low in the early stage. If the amount of insulin is not adjusted in time, some patients may have hypoglycemia. With the development of pregnancy, the amount of insulin needs to be increased. In the process of delivery, the physical consumption is relatively large and the amount of food is less. If the amount of insulin is not reduced in time, pregnant women are prone to hypoglycemia. When the postpartum placenta is

discharged from the body, the insulin secreted by the placenta will disappear. At this time, the amount of insulin should be reduced in time. Because of the complex changes of glucose metabolism during pregnancy, if the insulin quantity is not adjusted in time, the pregnant women may have hyperglycemia or hypoglycemia, and the severe cases may be due to hypoglycemia coma and ketoacidosis^{10,13}.

The population with high incidence of gestational diabetes are as follows: ①Obesity, the weight before pregnancy exceeds 20% of the standard weight, or the blind increase of nutrition after pregnancy, excessive food intake, less activity, and too much weight gain of pregnant women. ②Pregnant women with gestational diabetes or pregnant women with diabetes have appeared in their immediate relatives. ③Pregnant women with gestational diabetes occurred in the past. ④Pregnant women who have had a huge fetus with a weight of more than 8 Jin. ⑤The cause of death is unknown, such as stillbirth, neonatal death, and hydramnios. Gestational diabetes can be divided into four categories: ①Dominant diabetes: this type of pregnant women has obvious symptoms of diabetes (more than three or less) or diabetes before pregnancy. After treatment, they are pregnant or have diabetes symptoms during pregnancy, which still exist after delivery. ②Latent diabetes, such pregnant women did not have clinical manifestations of diabetes before or after pregnancy, but the glucose tolerance continued to be abnormal, but after a period of time, it may develop into "dominant" diabetes. In the pre diabetes period, such pregnant women have a family history of diabetes, but they have no disorder of glucose metabolism. Some complications may occur in the birth of a newborn, which may develop into "diabetes" after a period of time. ③Gestational diabetes, there is no glycometabolism disorder and clinical manifestations of diabetes before pregnancy, but after pregnancy, diabetes symptoms will appear, which may also lead to some complications. After pregnancy, diabetes symptoms will disappear. If pregnant again, diabetes will occur again, and these patients may develop dominant diabetes in a few years¹¹.

Pregnant women in pregnancy should pay attention to the prevention of diabetes, the prevention methods are: ①Correct intake of sugar,

intake of sugar is to provide heat, maintain normal metabolism, avoid the production of ketones. ②It is very important to eat less and have more meals, to keep the blood sugar level stable and to avoid ketemia. ③Balanced diet. ④In the range that can be ingested, more dietary fiber should be ingested. ⑤Control the total amount of food. Pay attention to protein intake¹².

CONCLUSION

To sum up, the control of blood glucose level in normal pregnant women with gestational diabetes can effectively improve the clinical symptoms and pregnancy outcomes of pregnant women and newborn women, reduce the incidence of complications, improve the quality of life of pregnant women, and reduce the risks of premature delivery, abortion, macrosomia, malformed fetus, stillbirth, neonatal hypoglycemia, etc.

REFERENCES

1. Ethridge Jr JK, Catalano PM, Waters TP. Perinatal outcomes associated with the diagnosis of gestational diabetes made by the international association of the diabetes and pregnancy study groups criteria. *Obstetrics and gynecology*. 2014;124(3):571.
2. Bistry LM, Egan AM, Dunne F, et al. Planned birth at or near term for improving health outcomes for pregnant women with gestational diabetes and their infants. *Cochrane Database of Systematic Reviews*. 2018(1).
3. Tsiros E, Grammatikopoulou MG, Theodoridis X, et al. Guidelines for medical nutrition therapy in gestational diabetes mellitus: systematic review and critical appraisal. *Journal of the Academy of Nutrition and Dietetics*. 2019;119(8):1320-1339.
4. Sokołowski Ł, Słodki M, Murlewska J, et al. Fetal echocardiography in the 3rd trimester of pregnancy as an essential element of modern prenatal diagnostics and perinatal care—recommendations of Polish Society of Prenatal Cardiology 2020. *Prenatal Cardiology*. 2020;2020(1):5-12.
5. Yueyue W, Chen L, Huang X, et al. A clinical analysis of subclinical hypothyroidism during pregnancy and the effect of thyroxine replacement therapy. *Chinese Journal of Endocrinology and Metabolism*. 2017;33(3):198-202.
6. Qian Y, Sun H, Xiao H, Ma M, Xiao X, Qu Q. Microarray analysis of differentially expressed genes and their functions in omental visceral adipose tissues of pregnant women with vs. without gestational diabetes mellitus. *Biomedical reports*. 2017;6(5):503-512.
7. Herrera CL, Schell RC, McIntire DD, Cunningham FG. Pulmonary hypertension complicating pregnancy: cardiac remodeling and residual concerns. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2020:1-6.
8. Liu PJ, Liu Y, Ma L, et al. The predictive ability of two triglyceride-associated indices for gestational diabetes mellitus and large for gestational age infant among Chinese pregnancies: a Preliminary Cohort Study. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 2020;13:2025.
9. Zhou Z, Chen G, Fan D, et al. Size and Shape of Associations of OGTT as Well as Mediating Effects on Adverse Pregnancy Outcomes Among Women With Gestational Diabetes Mellitus: Population-Based Study From Southern Han Chinese. *Frontiers in endocrinology*. 2020;11:135.
10. Kim H-S, Hwang H-S, Kwon H-S, Lim J-Y, Sohn I-S. A comparative analysis of maternal and fetal 25-hydroxyvitamin D in pregnant women with and without gestational diabetes mellitus. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2018;31(20):2748-2755.
11. Yan J, Du X, Yu Y, Xu H. Establishment of Risk Prediction Model for Retinopathy in Type 2 Diabetic Patients. Paper presented at: International Conference on Brain Informatics2019.
12. Cade TJ, Polyakov A, Brennecke SP. Implications of the introduction of new criteria for the diagnosis of gestational diabetes: a health outcome and cost of care analysis. *BMJ open*. 2019;9(1):e023293.
13. Alghafri RM, Gatt A, Formosa C. Depression symptoms in patients with diabetic peripheral neuropathy. *Rev Diabet Stud*. 2020;16(1):35-40. doi:10.1900/RDS.2020.16.35