

Influence of pregnancy outcome of gestational diabetes mellitus and nursing care

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Abstract

To explore the risk factors of gestational diabetes mellitus and its influence on pregnancy, and to analyze the risk factors of GDM. Now the proportion of gestational diabetes mellitus is much lower than before, but patients cannot belittle it. Because the quality of disease control will directly affect the safety of pregnant women and fetuses, poor control will lead to various complications. Pregnant women suffering from gestational diabetes should keep in close contact with doctors, nutritionists and other medical personnel during the whole pregnancy to facilitate reasonable control and reduction of the disease according to the pregnant woman's physical condition. This article will describe various complications of gestational diabetes mellitus and their impact on perinatal infants, analyze and put forward corresponding nursing suggestions.

Keywords

Gestational diabetes; Nursing intervention; Pregnancy outcome

1. Introduction

1.1. Background of the study

There are differences between the two concepts of gestational diabetes and diabetes mellitus, gestational diabetes mellitus mainly refers to patients who do not suffer from diabetes before pregnancy, pregnant women in the pre-pregnancy glucose metabolism is normal or the existence of potential hypoglycemic phenomenon, but in the middle or late gestation, along with the increasing gestational weeks, the pregnant woman's body insulin-resistant substances continue to increase, such as estrogen, luteinizing hormone and so on to make pregnant women insulin sensitivity gradually declined [1], in order to maintain the normal level of glucose metabolism will gradually rise in demand. The sensitivity of pregnant women to insulin gradually decreases [1], in order to maintain normal glucose metabolism, the demand for insulin will gradually rise. Due to the unique characteristics of glucose metabolism during pregnancy, this physiological change can not be compensated for,

resulting in an increase in blood glucose in the body and leading to gestational diabetes mellitus.

1.2. Current status of research

Gestational diabetes mellitus is an endocrine metabolic disease with a genetic predisposition to multifactorial predisposition, and is a high-risk factor for pregnancy, which may lead to a threat to the life safety of mother and child. Although the incidence of gestational diabetes mellitus has been greatly controlled with the advancement of medical technology, the complications of gestational diabetes mellitus still have a great impact on the outcome of pregnancy, and therefore must be highly emphasized.

2. Methods of investigation

2.1. Investigation of pregnancy outcome observation indicators

The investigation of adverse pregnancy outcomes of pregnant women includes the contents and indicators of delivery mode, premature rupture of membranes, postpartum hemorrhage, preeclampsia, amniotic fluid, amniotic fluid, amniotic fluid contamination, preterm labor, early abruption of the placenta, gestational hypertension, ketoacidosis, fetal distress and so on [2]. The indicators of each adverse outcome were defined as follows:

Table 1. Definitions of indicators of adverse pregnancy outcomes

Pregnancy Outcome	Definition
Postpartum Hemorrhage	Blood loss > 500mL within 24 hours after delivery.
Preeclampsia	Blood pressure > 140/90 mmHg after 20 weeks of pregnancy, AND 24-hour urine protein > 300 mg or random urine protein $\geq$ 30 mg/mL.
Polyhydramnios	Amniotic fluid volume > 2000 mL.
Oligohydramnios	Amniotic fluid volume < 300 mL.
Premature Rupture of Membranes (PROM)	Rupture of membranes before the onset of labor.

2.2. Survey of perinatal outcome observation indicators

The indicators of perinatal adverse outcomes of pregnant women were recorded, and the survey included: macrosomia, low birth weight, neonatal pneumonia, neonatal hypoglycemia, and neonatal asphyxia [3]. The indicators of each adverse outcome were defined as follows:

Table 2. Definition of various indicators of adverse perinatal outcomes

Perinatal Outcome	Definition
Low Birth Weight Infant	Infant birth weight < 2500 g
Macrosomia	Infant birth weight > 4000 g
Neonatal Asphyxia	Apgar score of the newborn < 7 points
Neonatal Hypoglycemia	Blood glucose level of the newborn < 2.2 mmol/L

2.3. Morbidity related unifactorial investigation

Data such as age of pregnant women, pre-pregnancy body mass index, prenatal body mass index, family history of diabetes mellitus were recorded for detailed records. Pre-pregnancy body mass index is the ratio of weight to body before pregnancy, and prenatal body mass index is the ratio of weight to height before delivery. In this case, the pre-pregnancy BMI is calculated as the pre-pregnancy weight (kg) divided by the square of the height (m^2), and the pre-natal BMI is the pre-delivery weight (kg)/square of the height (m^2). The world standard drawn up by the World Weight Organization is that the body mass index (BMI) is in the normal range when it is between 18.5 and 24.9. BMI > 25 is overweight, and BMI > 30 is obese [4].

2.4. Diagnostic criteria for gestational diabetes mellitus

The diagnostic criteria for gestational diabetes mellitus is a fasting blood glucose concentration of more than 5.1 mmol/L. Patients with fasting blood glucose concentration of more than 5.1 mmol/L are diagnosed with abnormalities of the 75g glucose tolerance test, and those with blood glucose concentration of more than 10.0 mmol/L one hour after the intake of glucose, and those with blood glucose concentration of more than 8.5 mmol/L two hours later are diagnosed with gestational diabetes mellitus [5].

3. Pathogenesis of Gestational Diabetes Mellitus

Endocrine changes in pregnant women during pregnancy will affect their blood glucose, cholesterol and protein metabolism. During pregnancy, the placenta of pregnant women will secrete some hormones with anti-insulin effect, such as estradiol, placental prolactin, luteinizing hormone and so on. With the formation of the placenta and the increase of the above hormones, the anti-insulin effect increases accordingly. Among other things, placental prolactin promotes the metabolism of free fatty acids and affects glucose metabolism, further contributing to diabetes. Additionally, there is an increase in cortisone secretion during pregnancy; cortisone promotes the production of endogenous glucose and reduces glycogen use, thereby decreasing insulin action. In the second trimester prolactin secretion grows to 5-10 times, which subsequently affects further insulin secretion by pancreatic islet cells [6]. Briefly, the main hormones with anti-insulin action include weak cortisone of prednisone, progesterone, placental prolactin, prolactin and estradiol. In addition, the placenta secretes placental insulinase, which will promote insulin hydrolysis and inactivation [7], leading to insulin degradation in the body. Although insulin secretion increases markedly during pregnancy, the sensitivity of peripheral tissues to insulin decreases; therefore, gestational diabetes mellitus is caused by a relative deficiency in insulin secretion during pregnancy.

4. Maternal Impact of Gestational Diabetes

4.1. Preeclampsia

Pregnant women with gestational diabetes mellitus have two to three times the risk of gestational hypertension than normal pregnant women. Risk factors for gestational diabetes mellitus eclampsia disease are age, primiparity, independent risk factors, multiple pregnancies, and gestational weight body mass index is an important indicator to monitor. The incidence of preeclampsia in pregnant women increases significantly with the increase in fasting glucose and glycosylated hemoglobin during pregnancy. High pre-pregnancy body mass index (BMI) and rapid weight gain during pregnancy are independent risk factors for gestational diabetes combined with pre-eclampsia [8]. Pregnant women with gestational diabetes mellitus usually have hyperinsulinemia with insulin resistance, which leads to vascular lesions manifested by narrow lumens and thickened endothelial cells. As a result, pregnant women with gestational diabetes mellitus are more likely to develop hypertensive disorders than healthy women. In addition, due to the reduced insulin compensation ability of the maternal body, when hypertensive disease occurs, the condition is more difficult to control. Therefore, to effectively reduce the incidence of pre-eclampsia, pregnant women should have good glycemic control and gestational weight.

4.2. Excessive Amniotic Fluid

Pregnant women with gestational diabetes mellitus are significantly more likely to develop excessive amniotic fluid than non-diabetic pregnant women, and the pathogenesis of this is unclear. Early studies have shown that the high glucose concentration in the fetus results in hyperosmolar diuresis, leading to increased fetal urination, which in turn leads to an increase in the glucose concentration in the amniotic fluid resulting in hyperosmolar amniotic fluid. In recent years, scholars have proposed that amniotic fluid transport is an important means of amniotic fluid transit [9]. Water channel proteins play an important role in the transmembrane transport of water in placental tissues and also in the exchange of body fluids between the mother and the fetus.

4.3. Cesarean section

Gestational diabetes mellitus per se is not an indicator of cesarean section, but gestational diabetes mellitus is prone to complication of other obstetric disorders, and the higher probability of delivering a macrosomic baby in gestational diabetes mellitus mothers indirectly contributes to an increase in the cesarean section rate in gestational diabetes mellitus mothers. The rate of cesarean section in pregnant women with gestational diabetes mellitus is as high as 92% because of the large size of the fetus. Due to large size, cephalopelvic asymmetry and weaker uterine contractions make labor abnormal. However, gestational diabetics have a high prevalence of macrosomia, so the cesarean section rate is elevated. Keeping blood glucose at

normal levels throughout pregnancy reduces the incidence of macrosomia as well as other complications. It increases the chances of vaginal delivery and reduces the rate of cesarean section. Patients with gestational diabetes should strengthen the management of blood glucose during pregnancy and achieve early diagnosis and treatment. Clinically, the choice of delivery often depends on the comprehensive status of the mother and fetus, and cesarean delivery purely because of gestational diabetes mellitus is not a standard indication for cesarean delivery [10]. Vaginal delivery is the preferred mode of delivery with monitoring of labor and judging the course of labor.

4.4. Postpartum hemorrhage

On the one hand, pregnant women with gestational diabetes mellitus have overweight fetuses and are prone to contractions and increased bleeding during delivery. On the other hand, due to high blood glucose, women are more likely to have prolonged labor, weak contractions and birth injuries during delivery. This makes pregnant women with gestational diabetes more prone to postpartum hemorrhage.

4.5. Premature rupture of fetal membranes

In the environment of high blood glucose concentration in pregnant women, the maternal resistance has decreased, and it is easy to propagate microorganisms in the cervix and vaginal vault, and these microorganisms hydrolyze the extracellular substances of fetal cell membranes, gradually reduce the collagen fibers, and reduce the flexibility of the membranes [11], which leads to premature rupture of the membranes. Therefore, gestational diabetes may be associated with increased nutrition and energy intake.

5. GDM Impact on Pregnancy Outcomes

Gestational diabetes can increase perinatal morbidity and perinatal neonatal mortality. Neonatal hypocalcemia, overweight, hypoglycemia, hyperbilirubinemia, erythrocytosis [12], and birth trauma all increase the risk of developing obesity in the future. Perinatal mortality in pregnant women with gestational diabetes mellitus is close to that of pregnant women with diabetes mellitus but significantly higher than that of pregnant women without diabetes mellitus. Fetal organs generally begin to be produced within 12 weeks of gestation, and gestational diabetes mellitus generally occurs in the second trimester of pregnancy, so the incidence of formation of fetal malformations is very low for gestational diabetic mothers. The incidence of macrosomia in gestational diabetes mellitus is higher than in non-diabetic women, scapular dystocia, labor injuries, and fetal death are all conditions to which macrosomia is prone. Therefore, correct extrapolation of fetal weight is important before delivery in pregnant women with gestational diabetes mellitus. So we should minimize obstetric complications, improve the quality of obstetrics and perform elective

cesarean section in suspicious pregnancies.

5.1. Fetal overgrowth

The main risk factors for gestational diabetes mellitus for producing a macrosomic child as a result of pregnancy include elevated fasting glucose, gestational weight gain, family history of diabetes mellitus, and history of macrosomia. Therefore, pregnant women with gestational diabetes mellitus should be monitored for fasting blood glucose, lipid levels, and gestational weight. In the traditional view, the hyperglycemia-hyperinsulin theory suggests that blood glucose is based on the mother being transported to the fetus through the placenta. Among other things, fetal hyperglycemia stimulates proliferation, hypertrophy and insulin secretion of pancreatic B cells, causing hyperinsulinemia and further promoting amino acid intake, protein synthesis and inhibiting lipolysis [13], leading to fetal overgrowth. In recent years, changes in placental transport and metabolic function have also been shown to have the potential to cause macrosomia. Insulin-like growth factor-1 in gestational diabetes mellitus affects fetal growth and metabolism, and prolonged hyperglycemic stimulation may lead to more rapid fetal growth, resulting in the production of macrosomia. There is also concern about fetal growth restriction, and the production of macrosomia may be associated with nutritional deficiencies in the daily diet of pregnant women with gestational diabetes. It is possible that differences in growth of giant babies may be related to active intervention in pregnancy and timely control of blood glucose levels.

5.2. Preterm labor

Because of gestational diabetes mellitus maternal own body's high blood sugar, resulting in amniotic fluid also has high sugar content, stimulating the amniotic membrane to secrete too much amniotic fluid, pregnant women and maternal hyperglycemia easy to induce fetal hypoxia, infection, etc., leading to preterm labor. The correlation between gestational diabetes and preterm labor is inconsistent, but elevated blood glucose during pregnancy makes the risk of spontaneous preterm labor increased, and one way to reduce the risk of preterm labor is to control blood glucose. It has been found that preterm fetal delivery is associated with the severity of gestational diabetes in pregnant women, and the incidence of preterm delivery in diabetics with poor glycemic control is significantly higher than in pregnant women with diabetes who have good glycemic control, while pregnant women with gestational diabetes who need to rely on insulin therapy have a higher incidence of preterm delivery than those who are treated with diet alone [14].

5.3. Perinatal mortality

Fetuses of pregnant women with gestational diabetes mellitus have a higher perinatal mortality rate compared to non-diabetic patients. Hyperglycemia in pregnant

women with gestational diabetes mellitus affects the supply of blood oxygen to the placenta of the fetus, and the development of fetal hyperglycemia and hyperinsulinemia increases the body's consumption of oxygen thereby causing maternal hypoxia in utero. The course, hyperglycemia level, duration, fluctuation and time of delivery in pregnant women with gestational diabetes have an impact on the prediction of the progression of the disease [15]. Termination of pregnancy at 39 weeks of gestation significantly reduces maternal mortality and neonatal mortality, and the level of glycemic control during pregnancy is closely related to perinatal care. Fetal distress is a syndrome in which the health and life of the fetus in the mother's uterus is jeopardized by acute or chronic hypoxia. One of the leading causes of neonatal death is neonatal asphyxia.

5.4. Shoulder Difficulties and Birth Injuries

Shoulder dystocia is one of the high risk factors for gestational diabetes. The fetus of a pregnant woman with gestational diabetes mellitus grows with an uneven body size, the body trunk grows faster than the fetal head, and the fat tends to be distributed on the shoulders and back. Therefore, the high prevalence of fetal in gestational diabetes also leads to an increased risk of shoulder dystocia. Shoulder dystocia not only increases the risk of postpartum hemorrhage and birth canal tears, but also leads to neonatal asphyxia, brachial plexus injuries, clavicle fractures, and intracranial hemorrhage.

5.5. Fetal malformations

A hyperglycemic environment can activate embryonic apoptosis, which may lead to malformations of various vital organs. The main fetal malformations are: central nervous system malformations, cardiovascular malformations, urinary tract malformations, and digestive tract malformations. Among them, the most common malformations in the central nervous system are neural tube defects. Ventricular septal defect, atrial septal defect, hypertrophic cardiomyopathy are cardiovascular malformations, urinary malformations include anorectal closure and visceral subluxation, polycystic kidneys and double ureter are digestive malformations. Other rare malformations that may be associated with gestational diabetes include bunions, thymic hypoplasia, and congenital crypt fossa. It is generally accepted that the higher the blood glucose level of the pregnant woman, the higher the incidence of fetal malformations. Some scholars have studied the relationship between glycemic control of pregnant women with gestational diabetes mellitus and the occurrence of fetal malformations. The results showed that pregnant women with gestational diabetes who had good glycemic control did not increase the incidence of fetal malformations, while pregnant women with gestational diabetes who had poor glycemic control had a fetal malformation incidence three to four times that of normal pregnant women. Nowadays, with the continuous progress of prenatal diagnosis tech-

nology and the widespread popularization of the concept of eugenics, neonatal malformations have been effectively controlled. Early screening, early diagnosis, and timely control of the patient's blood glucose level are closely related to the incidence of neonatal malformations.

5.6. Other Complications

Gestational diabetes mellitus can also cause complications such as neonatal polycythemia, neonatal respiratory distress syndrome, and neonatal hyperbilirubinemia. The pathophysiological basis of these diseases is persistent hyperglycemia and hyperinsulinemia. Hyperinsulinemia reduces the synthesis of fetal pulmonary surfactant, which increases the incidence of neonatal respiratory distress syndrome. The increase in metabolism, oxygen consumption, and chronic hypoxia stimulate extramedullary hematopoiesis, which easily accelerates fetal red blood cell production and leads to hyperbilirubinemia due to massive destruction of red blood cells after birth. Persistent hyperglycemia causes systemic microvascular lesions in pregnant women, insufficient placental blood supply, and fetal malnutrition, restricting fetal growth.

6. Nursing Measures for Gestational Diabetes

6.1. Psychological Nursing

Generally speaking, pregnant women with gestational diabetes may be overly concerned about their own illness and the condition of the fetus in their body, which leads to a more sensitive psychological state within the pregnant woman. Studies have shown that gestational diabetes mellitus pregnant women exist more adverse emotions, such as anxiety, depression, anger and so on. We can use the following methods to provide psychological care for patients and their families. First, we need to pay attention to the patient's mood at any time, health care workers can be based on the patient's psychological state, targeted guidance to pregnant women with gestational diabetes mellitus, the main reasons affecting the mood of the pregnant woman to give comfort and guidance to reduce the occurrence of bad feelings, to eliminate the worry, fear and other adverse psychological factors, to avoid the adverse effects caused by the patient's nervousness. Secondly, a successful case to help patients to build up the confidence and determination of the treatment, so that patients have a positive and healthy state of birth. We can also let the patients who have successful delivery and good prognosis to tell their own experience to other patients, in order to play the role of inspiring others and increase the self-confidence of other patients. Finally, we can actively carry out health education for patients' families and obtain the assistance of patients' families, so as to better help patients build up their self-confidence and improve their enthusiasm and initiative in treatment.

6.2. Dietary care

First of all, through dietary care, a detailed diet plan is made to control the blood glucose level of patients with gestational diabetes mellitus. Doctors and dietitians make a detailed diet plan according to the patient's gestational age, activity level and other factors, and the patient takes the total calories every day according to the plan, and this total calories are not set in stone, but should be changed according to the change of gestational weeks. It is also important to have a precise mix of carbohydrates, dietary fiber, fats, micronutrients, vitamins, and proteins. Prior to developing a diet plan, actively contact the patient to learn about dietary preferences and preferences, and meet the patient's preferences without personal dietary taboos that are inconsistent with a healthy diet, such as high salt, sugar, and fat. Adopt the dietary principles of limiting the amount of food, increasing the number of diets and improving metabolism, balancing the patient's diet, changing the patient's dietary habits, avoiding stimulating foods, and patients with spicy dietary habits should be explained and urged to cooperate with the implementation of the dietary program. At the same time, timely supplementation of the body's mineral elements, to ensure that the patient and the fetus can bring enough energy and nutrition. Secondly, health care personnel should urge patients to cooperate with the implementation of the diet plan, hospitalized patients to increase the number of examination rooms, confirm the follow-up of the patient's diet, to grasp the actual implementation of the patient's diet plan, because the diet is the best way to control the blood glucose of patients with gestational diabetes mellitus. By instructing patients to carry out a scientific and reasonable diet plan, the patient's blood glucose level can be effectively controlled. It is also necessary to ensure that the food can provide enough energy and nutrients for the patients; to ensure that the fetus can develop healthily and be able to obtain a variety of nutrients; in addition, the patients should also pay attention to postprandial hyperglycemia and avoid the occurrence of ketosis during fasting; to limit the excessive growth of the fetus; to balance the patient's diet [3], adopt the dietary principles of restricting the amount of food, increasing the number of diets, and improving the metabolism, avoiding stimulating foods, and trying to Avoid stimulating food, try to eat more high-fiber and high-nutrition food, and timely replenish the calcium, magnesium and iron needed by the body.

6.3. Exercise Care

Pregnant women can control their blood glucose through certain aerobic exercises that are appropriate for their physical state, especially aerobic exercise. Studies have shown that aerobic exercise has many benefits, such as increasing muscle resistance to oxygen, regulating metabolic function and immune function. For diabetic patients, through a certain amount of activity can improve insulin receptivity, improve insulin resistance, and effectively control blood sugar. For postpartum pregnant women, appropriate aerobic exercise, such as walking, yoga, etc. can also pro-

mote postpartum recovery. Conditional more can carry out outdoor exercise, receive appropriate sunlight, in order to promote fetal calcium absorption, in the exercise, there are health care personnel or family members, especially the husband's company, on the one hand, pregnant women will have a greater sense of security, on the other hand, pregnant women can receive more care, more conducive to the physical and mental health of the pregnant woman, and at the same time prevent and control accidents can not be carried out in a timely manner corresponding measures. Another thing to note is that a constant amount of activity can help control the body's blood glucose level, exercise should be in accordance with the exercise table, to guide the patient to perform, in the process of exercise, must be measured, can not be overworked. During exercise, it is important to be accompanied by medical personnel or family members so that accidents do not occur and appropriate measures cannot be taken in a timely manner.

6.4. Medication Nursing

If diet and exercise fail to control blood glucose, drug therapy is indicated. Regular blood glucose monitoring and scientific dosage adjustment are required. Prioritize dietary regulation and insulin over oral hypoglycemics (which may cause fetal hypoglycemia). Target levels: fasting ≤ 5.5 mmol/L, 2h postprandial ≤ 6.6 mmol/L to reduce fetal complications.

Dietary control is key: 125.5 J/(kg • d) for normal, 100 J/(kg • d) for overweight, 50 J/(kg • d) for moderately obese pregnant women. Insulin is needed if blood glucose remains high after diet control. Postpartum insulin dosage should be reduced due to decreased anti-insulin hormones, preventing hypoglycemia.[12]

Exercise enhances insulin sensitivity and reduces blood glucose, but maternal-fetal safety must be monitored (may increase preterm risk). In summary, GDM treatment is based on diet, combined with exercise and medication under close supervision.[3]

7. Conclusion

Gestational diabetes mellitus (GDM) significantly impacts pregnancy and perinatal outcomes, requiring enhanced management of high-risk populations. Early screening reduces incidence, with dietary/exercise interventions for mild hyperglycemia and insulin therapy for poor control. Complications like gestational hypertension and macrosomia increase cesarean rates, while new diagnostic criteria improve outcomes.

Strict glycemic control with scientific diet, exercise, and nursing reduces GDM incidence and complications. Hospital-community collaboration minimizes maternal-infant complications. Eugenic education, pre-pregnancy checks, gestational monitoring, nutritional adjustment, and focused high-risk monitoring are essential. Hyperglycemia increases neonatal risks; well-controlled cases can deliver naturally, while poor control requires enhanced checks and timely termination. Strict screen-

ing and diversified education reduce complications to normal levels, necessitating healthcare providers' improved risk factor awareness for better outcomes.

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