

# Gestational diabetes: pathophysiology and personal experiences

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## ARTICLE POINTS

**1** GDM is defined as glucose intolerance first recognised in pregnancy and generally develops in the third trimester of pregnancy.

**2** Ethnic origin is the most important independent variable associated with an increased risk of GDM.

**3** GDM can contribute to both poor infant and maternal outcome.

**4** The most common obstetric complications of GDM are neonatal hypoglycaemia and macrosomia.

**5** Personal experiences of GDM and professional evaluations may be inconsistent.

## KEY WORDS

- Gestational diabetes
- Pathophysiology
- Health beliefs

## Introduction

The literature on the management of gestational diabetes mellitus (GDM) neglects the specific personal experience of women who develop diabetes during pregnancy. Although health beliefs, influenced by culture, social background and experience of health and illness, are well-known indicators of patient outcome (Lupton, 1994), these appear to be undocumented or ignored by healthcare professionals when evaluating the management and outcomes of GDM. This paper discusses the pathophysiology and clinical management of GDM, and explores, through the use of case studies, the personal experiences of women who develop diabetes during pregnancy.

**G**estational diabetes mellitus (GDM) is defined as glucose intolerance first recognised in pregnancy. It includes a small number of women with previously unrecognised diabetes or impaired glucose tolerance (IGT). Of every 100 pregnant women, between two and five will be affected by GDM. Ethnic origin is the most important independent variable associated with an increased risk of developing GDM (Table 1) (Dornhorst & Beard, 1993).

Pregnancy causes changes in maternal carbohydrate metabolism that result in optimisation of maternal-fetal fuel transfer and fetal growth.

Additionally, insulin sensitivity decreases as a result of raised levels of oestrogen, cortisol and other hormones produced by the placenta. These hormones begin to block the effects of insulin from around the 18th week of pregnancy. This reduction in maternal insulin sensitivity requires a threefold increase in maternal insulin secretion to maintain normal glucose tolerance by the third trimester of pregnancy. Women with insufficient beta cell reserve to cope with these demands become glucose intolerant (Buchanan and Dornhorst, 1996).

There is a lack of consensus regarding the diagnostic criteria for GDM, as well as controversy surrounding evidence which suggests that improving mild disturbance of maternal glycaemia improves pregnancy outcome (Dornhorst and Chan, 1998). However, there is substantial evidence to

suggest that maternal hyperglycaemia due to GDM contributes to both poor infant and maternal outcome.

If GDM is detected and managed appropriately, the risk of developing these complications can be reduced (Maresh et al, 1989; Hod et al, 1991; Jovanovic et al, 1996). The most common obstetric complications of GDM are neonatal hypoglycaemia and macrosomia.

## Neonatal hypoglycaemia

Neonatal hypoglycaemia can occur postpartum in babies where high maternal blood glucose levels have stimulated the fetal pancreas to secrete more insulin.

**Table 1. Women at greatest risk of developing gestational diabetes mellitus (GDM)**

- Women in the following ethnic groups: Indo-Asian, Afro-Caribbean, African, Arab Mediterranean or Hispanic
- Older women (prevalence increases with age)
- Women who are overweight
- Women with a family history of diabetes
- Women who have had previous GDM
- Women who have had previous large babies
- Women who have had previous unexplained stillbirth or neonatal death

After delivery, when the baby's own blood glucose levels are normal, it can take up to 24 hours before excess insulin levels are reduced, thus exposing the baby to the risk of hypoglycaemia (Hawdon and Anysley-Green, 1996).

### Macrosomia

Macrosomia is defined as a fetus growing above the 95th centile for gestational age. This condition begins to occur after 10–14 weeks gestation, when the fetal pancreas has developed and become sensitive to maternal blood glucose levels (since glucose crosses the placental barrier). If maternal blood glucose levels are high, the fetus produces more insulin. Fetal insulin stimulates somatic and skeletal growth of insulin-sensitive tissues, leading to macrosomia (Dornhorst and Beard, 1993).

Macrosomia may cause several problems. First, vaginal delivery may be difficult as a result of the large body size of the baby. Secondly, babies with macrosomia are more likely to be induced early, when their lungs are immature, increasing their risk of

respiratory distress (Hawdon and Anysley-Green, 1996).

### Diagnosing GDM

GDM generally develops in the third trimester of pregnancy. It is recommended that urine should be tested for glycosuria at every antenatal visit. All pregnant women should have a random laboratory blood glucose test at the booking visit and again between 26 and 28 weeks gestation. However, a random blood sugar test should be performed earlier than this if glycosuria is persistent (1+ or more) or other risk factors for GDM are present (Table 1) (Gillmer, 1996).

If the random laboratory blood glucose level is >6.0 mmol/l in the fasting state or 2 hours after food, or >7.0 mmol/l within 2 hours of food, an oral glucose tolerance test (OGTT) is indicated (Gillmer, 1997).

A diagnosis of GDM is made when the blood glucose level is >8.9 mmol/l (or >7.8 mmol/l depending on the diagnostic criteria being implemented) 2 hours after a 75 g glucose load (Hadden, 1996).

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### Case study I

Mrs PTK was 36 years old. She was born in Vietnam and had lived in the UK for the past 12 years. She had two previous pregnancies (girls aged nine and six), and a strong family history of type 2 diabetes. (A sister also living in the UK had gestational diabetes mellitus (GDM) during her second pregnancy.)

At 26 weeks gestation, Mrs PTK was found to have a random blood sugar level of 8.4 mmol/l 2.5 hours after her last meal. An oral glucose tolerance test (OGTT) was ordered. The results were as follows:

- Fasting glucose 4.0 mmol/l
- 60 minutes 13.0 mmol/l
- 120 minutes 11.3 mmol/l

Mrs PTK was seen by the DSN with the results of the OGTT. A simple explanation re GDM was given, along with 'first-aid' dietary advice. Initial assessment found that Mrs PTK was eating a large amount of refined carbohydrate and drinking almost a carton of fruit juice a day. She was reassured by the DSN and taught self-blood glucose monitoring (SBGM). She was asked to test four times a day (before breakfast and one hour after each meal) and record the results in a SBGM diary. An appointment was given for the specialist diabetes antenatal clinic in 4 days time.

At the clinic, a full physical, psychosocial and dietary assessment was carried out. Mrs PTK weighed 65 kg, her

blood pressure was 98/60 mmHg, and her HbA<sub>1c</sub> was 5.6%. Her SBGM profile was as follows: before breakfast 6.6–8.4; after breakfast 10.5–11.6; after lunch 7.7–15.3; after dinner 9.0–12.5.

After a discussion with Mrs PTK and members of the specialist team, insulin therapy was commenced. Mrs PTK said she had expected that she would need insulin for the remainder of her pregnancy, just as her sister had.

Mrs PTK declined the use of an insulin pen device, preferring to use a syringe like her sister. She was monitored by the specialist team at least every 2 weeks for the remainder of her pregnancy.

A baby boy weighing 4300 g (9 lb 8 oz) was delivered at 40+2 gestation by spontaneous vertex delivery. There had been some difficulty delivering the baby's shoulders. Mrs PTK felt that 'things had gone as well as could be expected'. She had done everything she could for the baby and the result was this 'big beautiful boy'.

At the postnatal appointment 6 weeks after delivery, Mrs PTK had a HbA<sub>1c</sub> of 5.9%. An OGTT diagnosed impaired glucose tolerance.

Mrs PTK was seen by the diabetologist and dietitian and given the OGTT results. She said she was not surprised that things had not gone back to normal; she was just like her sister. The dietitian reinforced lifestyle strategies (Table 3) and a repeat OGTT was arranged for 6 months time.

## Case study 2

Ms SB, a 35-year-old Caucasian social worker, was found to have a random blood sugar level of 10.1 mmol/l at 27 weeks gestation. This was her first pregnancy and she stated that there was no history of diabetes in her family as far as she knew. Ms SB's relationship with the baby's father had ended earlier during the pregnancy. GDM was diagnosed following a glucose tolerance test (OGTT).

When Ms SB was informed of the result of the OGTT she was extremely distressed. Understandably she was very concerned for her baby's health and safety. The DSN was able to acknowledge the feelings of fear and anger that Ms SB was experiencing, and encouraged and facilitated expression of these emotions. Importantly, she also elicited Ms SB's previous experience of diabetes (which was very limited), and her beliefs as to why she thought she had developed gestational diabetes mellitus (GDM).

Ms SB felt that her condition was due to her smoking (5–10 per day) and her diet: she liked fast foods. The DSN reassured Ms SB and gave her a simple explanation of GDM with 'first-aid' dietary advice. She was taught self-blood glucose monitoring (SBGM) and given an appointment for the specialist diabetes antenatal clinic.

Before the clinic, the DSN was able to liaise with other members of the team to discuss Ms SB's distress and health beliefs surrounding her diagnosis. All members of the team were aware of Ms SB's distress and this was considered when assessing Ms SB and defining her management plan. A full physical and dietary assessment was performed. Ms SB weighed 65 kg; her blood pressure was 120/60 mmHg and her glycated haemoglobin (HbA<sub>1c</sub>) was 5.7%. Her SBGM profile was as follows: before breakfast 4.1–6.1; after breakfast 9.7; after lunch 8.1–10.9; and after dinner 8.9–12.6.

The dietary assessment showed that although her diet was generally 'unhealthy' (high in fats), in terms of sugar and carbohydrate there was little room for adjustment. The only change suggested to improve her glucose tolerance was to spread the carbohydrate intake more evenly through the day.

The diabetologist and DSN discussed the need for insulin therapy with Ms SB. Her reaction was one of horror. She felt that the situation was an appropriate punishment for what she had caused to happen. The DSN discussed these health beliefs with Ms SB and explained in more detail the pathophysiology of GDM. However, the power of her health beliefs (GDM as a punishment) over the rational medical-scientific explanation of GDM (glucose intolerance) was acknowledged by the team.

A baby girl weighing 3940 g (8lb 11 oz) was delivered at 39+1 gestation by spontaneous vertex delivery. There were no complications. Ms SB stated that she and the baby were lucky that things had turned out so well, but it was no thanks to her. She was worried about the effect that GDM would have on the baby in the future.

At her 6-week postnatal appointment Ms SB had a HbA<sub>1c</sub> of 5.9%. Her OGTT was normal.

Ms SB was informed that at the present time she no longer had a problem with glucose tolerance. The dietitian discussed with Ms SB the risk of her developing type 2 diabetes in the future and lifestyle strategies that she could implement to reduce this risk (Table 3). The high risk of developing GDM in any future pregnancies was also discussed. Ms SB stated very firmly that she planned no further pregnancies: she felt that she could never go through another pregnancy again.

appointment for the next specialist diabetes antenatal clinic should be given. At this appointment a full physical, dietary and psychosocial assessment is made, a management plan is agreed between the woman and the specialist team, and a programme of education is commenced (Table 2).

### Management of GDM

Initial management of GDM is by dietary measures and increased activity levels, e.g. a daily walk. However, if glycaemic control continues to exceed the stated parameters, insulin therapy will need to be commenced (refer to local protocols).

### Delivery

During delivery, an intravenous infusion of glucose and an insulin pump may be used to

control the blood glucose levels, especially if insulin has been used during the pregnancy. If the diabetes has been controlled by diet, an insulin pump is rarely necessary.

### Postnatal follow-up

A postnatal OGTT should be performed 6 weeks after delivery. If the blood glucose levels have returned to normal, the factors shown in Table 3 should be discussed. If the OGTT indicates a diagnosis of impaired glucose tolerance (IGT) or frank diabetes, the local protocol for follow-up should be implemented.

### Conclusion

The two case studies presented here demonstrate the distinct personal experiences of two women who shared the same diagnosis and very similar physical characteristics. Their differing social situations and health

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2 However, if glycaemic control continues to exceed the stated parameters, insulin therapy will need to be commenced.

**Table 2. Educational framework for women with gestational diabetes mellitus (GDM)**

- What is GDM?
- What is insulin?
- Action of insulin
- Blood glucose monitoring (BGM) — how, when and why
- Targets for self-monitoring of blood glucose
- Dietary management
- Exercise/activity
- Management during delivery
- Postnatal care

beliefs surrounding the diagnosis of GDM resulted in a positive experience for Mrs PTK, but a negative experience for Ms SB.

However, when the experiences of the two women were evaluated from the professional perspective, it was Ms SB who had the better outcome: there were no complications during the delivery and the postnatal OGTT was negative.

The case studies also demonstrate the importance of the specialist team in recognising, acknowledging and understanding Ms SB's perspective, including her explanatory model of GDM. By eliciting this knowledge the team was able to support and help her deal with issues relating to her health beliefs and the emotions emerging from them. Mrs PTK's previous experience of GDM was used in a positive way and utilised when developing her management plan.

These experiences, which are not atypical, emphasise the often unrecognised importance of perceiving and acknowledging the way an individual conceptualises and makes sense of her condition. To

**Table 3. Reducing the risk of developing type 2 diabetes in later life**

- Discussion at postnatal appointment regarding:
- Lifestyle issues (healthy eating patterns, regular exercise, avoiding weight gain)
  - The risk of developing type 2 diabetes in later life
  - The high risk of developing gestational diabetes mellitus in any future pregnancies

paraphrase the words of Plato: the cure of the part should not be attempted without a knowledge of the whole. ■

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