Diagnosing gestational diabetes mellitus in women following bariatric surgery: A national survey of lead diabetes midwives

Abstract

Background: Bariatric surgery is becoming more common among women of fertile age to manage obesity. The number of pregnancies following bariatric surgery is, therefore, likely to rise. The standard oral glucose tolerance test (OGTT) may lead to dizziness, sweating and collapse in people after some types of bariatric surgery.

Aims: In view of this potential pitfall in the diagnosis of gestational diabetes mellitus (GDM) after bariatric surgery, the authors surveyed midwifery units to establish current practice for the screening and diagnosis of GDM in women who have had bariatric surgery.

Methods: Out of 164 English obstetric units, 120 email surveys were sent to a network of lead diabetes midwives in units across England. A reminder email was sent 4 weeks later.

Findings: Twenty-seven (22.5%) responses were received. Five respondents (26%) had specific policies in place to manage pregnancies after bariatric surgery. A wide variety of approaches to GDM screening and diagnosis were used in women with a history of bariatric surgery. The OGTT was the most widely used test after bariatric surgery.

Conclusions: There is a need for national clinical guidelines to be developed for the diagnosis of GDM after bariatric surgery.

Keywords: Bariatric surgery, Gestational diabetes, Obesity, Pregnancy

In the UK, approximately one fifth of women aged 16–40 years are obese (body mass index (BMI) ≥30 kg/m²) and half of all women are either obese or overweight (Buchwald et al, 2009).

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Obesity is a substantial risk factor for type 2 diabetes mellitus (T2DM) and gestational diabetes mellitus (GDM). Women with pre-existing diabetes have a fivefold increased risk of stillbirth, a threefold increased risk of perinatal mortality and a threefold increased risk of fetal congenital anomaly (Macintosh et al, 2006; Bell et al, 2012; Tennant et al, 2014).

Women are increasingly turning to bariatric surgery to manage their obesity; worldwide, 49% of patients undergoing bariatric surgery are women of childbearing age (18–45 years) (Roehrig et al, 2007; Maggard et al, 2008). Gastric banding, Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy are the most common procedures performed in the UK (Welbourn et al, 2014). Gastric banding may be considered a restrictive procedure as it limits the amount of food entering the stomach. Gastric bypass is sometimes considered to have a restrictive element (reduction in stomach size) as well as a malabsorptive component (due to a shortened length of intestine). Laparoscopic sleeve gastrectomy is performed in 16% of cases and involves reduction of the stomach to a quarter of its size. It is a more recent procedure and is capable of achieving significant weight loss and T2DM remission (Kehagias et al, 2013).

The National Institute for Health and Care Excellence (2014) recommends bariatric surgery as an option in people with a BMI ≥35 kg/m² in the presence of one other risk factor (for example, T2DM) and if the patient has exhausted all other methods of weight loss and attended a specialist weight management clinic or its equivalent.

The prevalence of obesity is predicted to continue rising, so will increasingly include women of childbearing age. The number of conceptions and pregnancies following bariatric surgery is, therefore, likely to increase in the coming years. In addition, an increase in unplanned pregnancies may occur after bariatric surgery, because obesity impairs female

reproductive function and this may be improved by bariatric surgery (Legro et al, 2012).

The risk of developing diabetes in pregnancies following bariatric surgery is contentious, in part because there are no guidelines specifically for screening and diagnosis of GDM or the re-emergence of T2DM after bariatric surgery.

The usual test for GDM in pregnant women is the oral glucose tolerance test (OGTT) (*Box 1*). However, ingesting a carbohydrate drink may cause 'late dumping'; this is a form of 'reactive hypoglycemia' that occurs 1–3 hours after meal ingestion following RYGB, but rarely after sleeve gastrectomy and not after gastric band. After RYGB, food exits the small stomach pouch quickly as the pylorus is now bypassed, and is rapidly absorbed from the proximal small intestine. There is a brisk rise in 'incretin' hormones (such as glucagon-like peptide-1) from the gut. Incretins cause a greater insulin response to hyperglycaemia and may lead to hypoglycaemia. These patients present with dizziness, fatigue, sweating, weakness, nausea and vomiting, and even collapse. Inducing these symptoms in a pregnant woman is clearly something to be avoided.

Aim

This study aimed to survey lead diabetes midwives to establish current practice for the screening and diagnosis of GDM in women who have had bariatric surgery. In particular, it aimed to determine whether the 75g OGTT was being used in women after bariatric surgery.

Methods

Of 164 obstetric units in England, a network exists of 120 lead diabetes midwives. A cross-sectional email survey of the members of the network was undertaken in August 2015, to assess current practice for the diagnosis of GDM in women with a history of bariatric surgery. The survey sought information on numbers of women with bariatric surgery ever encountered in the midwives' obstetric units, the GDM screening criteria employed and the gestational timing of screening, diagnostic criteria used and whether the criteria changed with type of bariatric surgical procedure. The questions were designed using statements with response categories, plus the option of open text boxes.

A second email was sent as a reminder 4 weeks after the initial email. The survey closed in October 2015.

Descriptive statistics were performed using SPSS version 21.

Box 1. Oral glucose tolerance test

This test involves fasting the mother from 10pm (water is permitted). The procedure ideally starts between 8.30am and 10am the following morning. A fasting venous sample is taken for glucose concentration and then 75g of anhydrous glucose (or its equivalent) is ingested in a volume of 300ml over 5 minutes. Two hours later, a further venous sample is taken for glucose concentration.

Consent and ethical approval

Responses were confidential and no data that might identify individuals or units were requested. Returned, completed questionnaires were considered indicative of consent to participate. The email text stated that the information may be used for publication. Ethical approval is not required for a survey of current practice. The project was deemed a service evaluation by the University of Surrey ethics committee and a local NHS Research and Development department.

Results

A total of 120 emails were sent and 27 responses were received (22.5%). The size of the maternity units ranged from 800–8000 births per annum (median 5000 births per annum).

Twenty-six of the respondents (96.3%) had provided antenatal care to women after bariatric surgery.

Identification of women with previous bariatric surgery and pathways of care

The surgical history of the women was identified by patient self-report ($n=25$, 92.6%), referral or direct contact with surgical team ($n=2$, 7.4%), referral or direct contact with another health professional ($n=8$, 29.6%) or from review of medical records ($n=9$, 33.3%); more than one method per respondent could be given. Seven respondents (25.9%) reported that their workplace had specific policies in place for management of pregnancies after bariatric surgery. Ten units (37.0%) had policies that made reference to bariatric surgery, 11 (40.7%) did not, and five respondents (18.5%) were uncertain; one respondent did not answer the question relating to their unit's policy for bariatric surgery. There was a recognition that more intensive monitoring was indicated in these pregnancies: $n=19/26$ (73.1%) would refer to a specialist unit, $n=24$ (92.3%) would request involvement of more senior members of the team for input into the management, $n=20$ (76.9%) felt more frequent scheduling of appointments was indicated, and $n=17$ (65.4%) would arrange for additional screening tests for pregnancy complications.

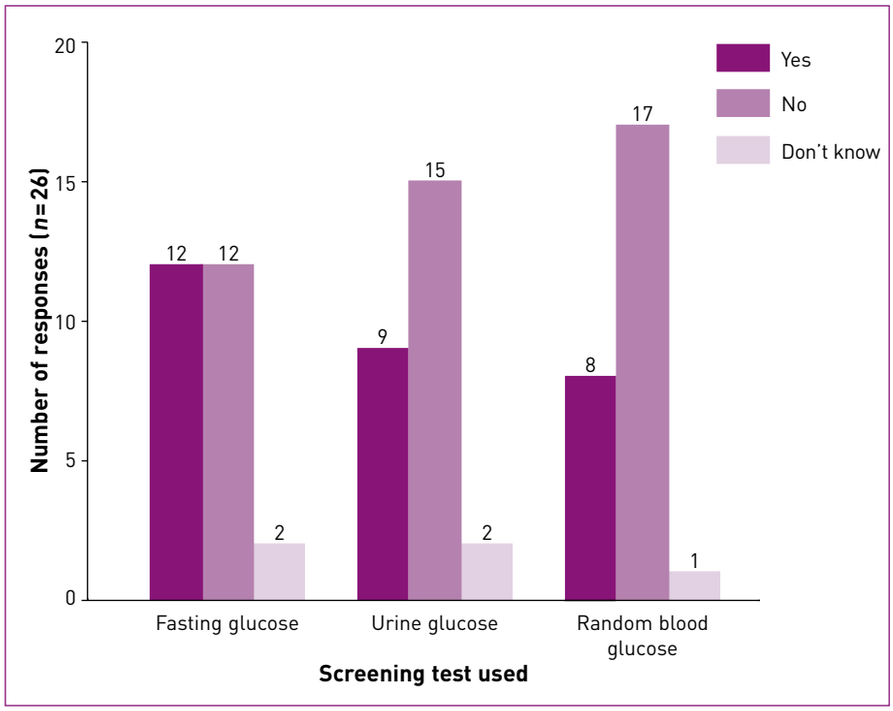

Figure 1. Gestational diabetes mellitus screening test used for women with history of bariatric surgery

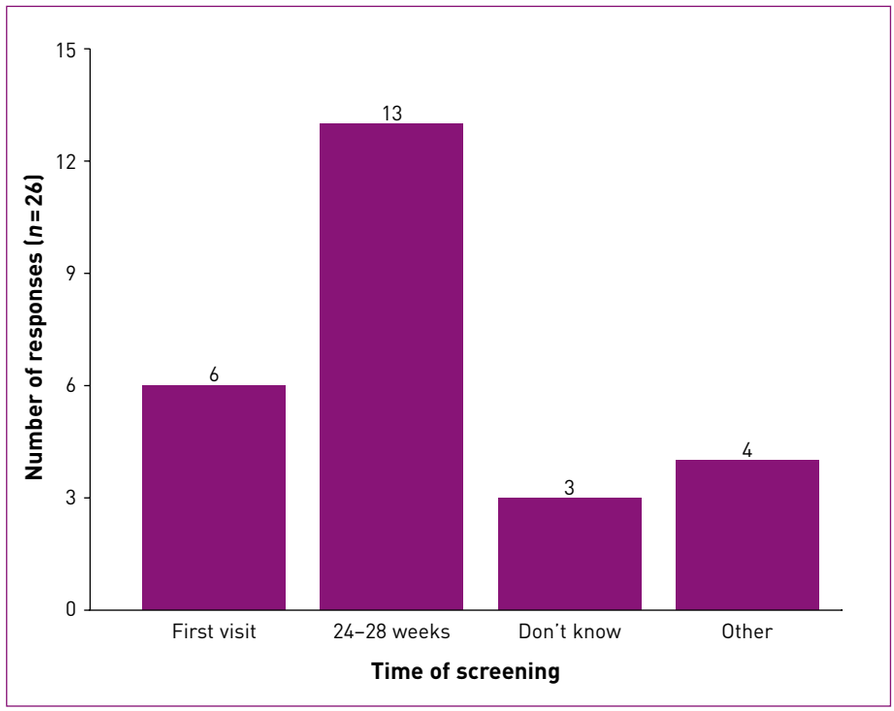

Figure 2. Time of gestational diabetes mellitus screening

Screening criteria

A variety of approaches to GDM screening were used in women with a history of bariatric surgery (*Figure 1*). Screening predominantly occurred either at booking ($n=6$, 23.1%) or between 24–28 weeks (n=13, 50.0%) (*Figure 2*). Four respondents (15.4%) provided an alternative response: one replied that screening would not be done, one at booking, one answered with random blood sugar at booking and OGTT at 24 weeks, and one with a urine test at every appointment.

GDM diagnostic criteria

Following RYGB, GDM was diagnosed using a variety of methods (*Figure 3*; 18 respondents), with the 75g OGTT being the most frequent method ($n=11$, 61.1%).

An OGTT criterion of 2-hour ≥7.8 mmol/L was used in 12 centres, in which the fasting criteria were ≥5.3 mmol/L in one centre, ≥5.6 mmol/L in eight centres and ≥6.1 mmol/L in three centres.

If the initial diagnostic test was negative, policy differed between centres as to follow-up assessment: three respondents said they did not know whether their centres would re-test; eight would not re-test; and seven would re-test (two only if there was evidence of clinical features such as polyhydramnios or macrosomia; with the remaining five retesting between 24–28 weeks).

Five centres would use an alternative diagnostic test if surgery other than RYGB had occurred; eight would use the same test; and 13 respondents said they did not know. Of the five centres using an alternative test, two would use OGTT, two continuous glucose monitoring and one HbA_{1c} (threshold HbA_{1c} >5.8%).

Discussion

This study has identified considerable heterogeneity in the diagnostic pathways for GDM in pregnancies occurring after bariatric surgery. In particular, clinical practice differed as to whether to tailor a diagnostic test for GDM according to the type of bariatric surgery that had preceded the pregnancy.

In the last two decades, the proportion of patients with diabetes resolution after bariatric surgery varied widely depending on both the type of surgery and the diagnostic criteria used. In 2009, a consensus report from the American Diabetes Association defined remission of T2DM as a return to normal measures of glucose metabolism (HbA_{1c} below 6%, fasting glucose less than 5.6 mmol/L) at least 1 year after bariatric surgery without hypoglycaemic medication (Buse et al, 2009). It may be the case that disparity in diagnostic criteria for GDM in this study relates to a wider difficulty of determining glycaemic status after bariatric surgery. The new, stringent criteria for diabetes remission led to a reduction in the reported frequency of diabetes resolution (Pournaras et al, 2012), although RYGB remains more efficacious at diabetes resolution than

gastric band. Remission of T2DM, before any significant weight loss has taken place (after RYGB), has been partly attributed to a change in gut hormone (incretin) secretion (Knop and Taylor, 2013). Based on data from clinical coding, the rate of GDM after bariatric surgery may be reduced by up to 75%; however, the criteria used to diagnose GDM were not reported (Burke et al, 2010; Johansson et al, 2015). Pregnancy itself has been reported to lead to a brisk incretin response, but it is not known whether this is in addition to the response seen after bariatric surgery (Valsamakis et al, 2010).

Most lead diabetes midwives reported that their unit would refer a mother with a history of bariatric surgery for specialist review. This may reflect concern about the health outcomes for the mother or fetus in these pregnancies. A recent meta-analysis suggests that women becoming pregnant after metabolic surgery have increased risk for premature and small-for-gestational-age babies and so may be considered high-risk (Johansson et al, 2015). However, it has yet to be proven whether these risks are in addition to the known pregnancy risk factors of diabetes and obesity. Provision of pre-conception clinics for these women is often lacking, therefore a dietitian review ought to be considered at booking.

Despite most respondents having cared for pregnant women with a history of bariatric surgery, a far lower proportion worked in centres that had specific protocols in place for this group of women. Given the rise in prevalence of obesity and hence surgical procedures, this is an area that needs addressing. In addition, the high percentage of respondents using an OGTT to diagnose GDM after RYGB is concerning, as this test can induce significant adverse symptoms due to the associated 'dumping' syndrome. At the current time there is no evidence base for alternatives to the OGTT to diagnose diabetes in pregnancy. A pragmatic approach is for frequent self-monitoring of blood glucose with pre- and post-meal testing. Continuous glucose monitoring systems may prove to be helpful to identify periods of hyper- or hypoglycaemia and glycaemic variability (Bonis et al, 2016).

Limitations

Response representativeness is more important than response rate in survey research; in this survey, all but one of the respondents had seen women with pregnancies following bariatric surgery, and a clear majority of the lead diabetes midwives surveyed used OGTT in women after RYGB. However, the low response rate of 22.5% increases the potential for non-reponse bias. Response rates to surveys are usually low and may be declining further (Cook et al, 2009; Cho et al, 2013). A meta-analysis found that response rates of health professionals to online surveys average at 38%, compared to 57% for postal surveys (Cho et al, 2013). Factors that enhance response rates include monetary incentives, shorter questionnaires, relevance of the survey topic, use of reminders and prenotification contact (McColl et al, 2001). Our questionnaire was limited to a maximum of 23 questions and we used one reminder. Feedback received was that the study was highly relevant.

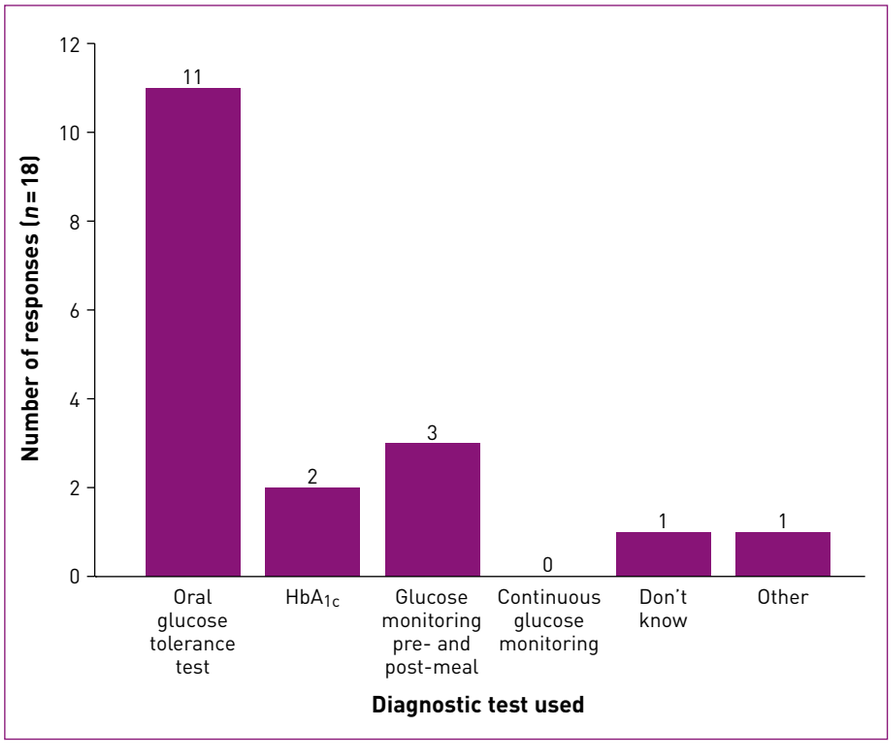

Figure 3. Diagnostic test used following Roux-en-Y gastric bypass

Conclusion

This survey has highlighted divergent practice in the diagnosis of GDM after bariatric surgery in the UK. Clinical trials are needed to test the comparative performance of screening and diagnostic strategies for GDM in women after bariatric surgery, in order to develop clinical guidelines. **BJM**

***Conflict of interest**: The authors have declared no conflict of interest.*

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Key points

- The number of women becoming pregnant after bariatric surgery is likely to rise in the coming years
- A minority of maternity units have specific policies in place to manage pregnancies after bariatric surgery
- This study shows that current practice in screening for and diagnosing gestational diabetes in this group of women is highly variable
- Work is needed to test the comparative performance of screening and diagnostic strategies for gestational diabetes in women after bariatric surgery, in order to develop clinical guidelines

> This survey has highlighted divergent practice in the diagnosis of gestational diabetes mellitus after bariatric surgery in the UK

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