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Comparing continuous glucose monitoring with self-monitoring of blood glucose in gestational diabetes

Submission date
23/07/2018

Recruitment status
No longer recruiting

Registration date
08/08/2018

Overall study status
Completed

Last Edited
24/07/2019

Condition category
Pregnancy and Childbirth

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Gestational diabetes (GDM) develops during pregnancy and is becoming increasingly common. High blood sugar levels are associated with problems for both the mother and baby during pregnancy and delivery, including large birth weight, birth injury, low blood sugar levels in the baby and the need for a caesarean section. Women with GDM are advised to test their sugar levels 6 times per day in order to keep sugar levels within recommended targets, and to guide decisions about treatment, aiming to reduce the risk of complications. Currently women with GDM use finger-prick testing to measure their sugar levels at home; however it is known that testing may not be undertaken as often as advised, for several reasons. The aim of this study is to assess whether using a continuous glucose monitoring (CGM) sensor instead of finger-prick testing results in more reliable recording of glucose levels compared with standard finger-prick testing, and in consequence whether this helps achieve improved overall sugar levels at the end of pregnancy.

Who can participate?
Pregnant women aged 18 or over with GDM

What does the study involve?
Participants are randomly allocated to use either finger-prick testing (self-monitoring of blood glucose [SMBG]) or CGM sensors for 4-6 weeks. Sugar levels are also recorded at the beginning and end of the study using another sensor for healthcare professionals. Information is also collected about the birth, including baby's birth weight. GDM usually resolves quickly once the baby is born, but it is not clear how rapidly this occurs. The final part of the study uses a CGM sensor for the first 2 weeks after the baby is born, to observe sugar levels during this period. It is optional for women to take part in this.

What are the possible benefits and risks of participating?
Participants allocated to CGM may benefit from being in the study by having access to real-time CGM which is a relatively new and exciting technology, and not usually available to women with GDM via the NHS. Women in the SMBG group are not disadvantaged compared to those not

taking part in the study, as they undertake standard care glucose testing. All participants have the option to take part in the extended subgroup after giving birth, which is an additional glucose monitoring phase compared to that of standard care. There are few additional risks posed to women who take part in this study compared to that of standard care. The safety of the Freestyle Libre flash glucose monitoring sensor has been tested by the manufacturer. Participants in the CGM group will keep their SMBG equipment at home, should they experience a problem with their CGM device. The Freestyle Libre Pro is not approved for use in pregnancy as it has not been tested for use in this patient group. However, the device itself is very similar to the standard version of the Freestyle Libre, and the research team is not aware of any reported risks when used in pregnancy and would not expect this to be the case. Participants will be advised of the need to remove the sensor before surgery (including caesarean section) involving diathermy, or imaging involving x-ray, CT or MRI as per the device recommendations, to avoid placing participants at any increased risk. Occasionally the adhesive patch can cause some skin itching or a mild rash, and there may be a small amount of bleeding upon application which resolves spontaneously. Participants may experience discomfort when providing blood samples. These risks are considered small and extremely unlikely to cause lasting harm or distress to participants.

Where is the study run from?
Queen Alexandra Hospital (UK)

When is the study starting and how long is it expected to run for?
October 2017 to September 2019

Who is funding the study?
Mylan Ltd

Who is the main contact?
Dr Katherine Alington
katherine.alington@porthosp.nhs.uk

Contact information

Type(s)
Scientific

Contact name
Dr Katherine Alington

ORCID ID
http://orcid.org/0000-0003-4547-8158

Contact details
Academic Department of Diabetes and Endocrinology
Queen Alexandra Hospital
Southwick Hill Road
Portsmouth
United Kingdom
PO6 3LY
+44 (0)2392 286000 ext 6260
katherine.alington@porthosp.nhs.uk

Additional identifiers

EudraCT/CTIS number

IRAS number

ClinicalTrials.gov number

Secondary identifying numbers
37522

Study information

Scientific Title
Randomised controlled trial to compare interstitial glucose monitoring with self-monitoring of blood glucose in gestational diabetes

Study objectives
The aim of this study is to assess whether using a continuous glucose monitoring (CGM) sensor instead of finger-prick testing results in a more reliable acquisition of glucose levels compared with standard finger-prick testing, and in consequence whether this helps achieve improved overall sugar levels at the end of pregnancy.

Ethics approval required
Old ethics approval format

Ethics approval(s)
South Central - Berkshire, 27/03/2018, ref: 18/SC/0089

Study design
Randomised; Interventional; Design type: Process of Care, Education or Self-Management, Device, Active Monitoring

Primary study design
Interventional

Secondary study design
Randomised controlled trial

Study setting(s)
Home

Study type(s)
Treatment

Participant information sheet
Not available in web format, please use the contact details to request a patient information sheet

Health condition(s) or problem(s) studied
Gestational diabetes

Interventions
Study design
This study is a randomised controlled trial. 40 participants will be recruited, so that there are 20 participants in each arm. This is based on sample calculation, and allows for a proportion of participants that are withdrawn, or for premature delivery prior to the final 2 week sensor wear period. Participants will be randomised to each arm using an online randomisation system with random permuted blocks. The control arm is the SMBG arm, and all women in this arm will receive exactly the same care as women that are not in the study. The women in the CGM arm will use an alternative glucose monitoring technique, which has been licenced for use in pregnancy, used frequently in clinical care in other groups of patients with diabetes, and which is not known to be inferior to SMBG, although it has the potential to be beneficial to these women. There are no planned interim analyses. After completion of all study visits, the data will be analysed. The results of the Pro sensor worn by women in the extended sub-group postpartum will be reviewed upon receipt, however, to ensure there are no adverse glycaemic features that would require clinical input.

Study setting and recruitment
The study will be undertaken in the Maternity Outpatients Department at Queen Alexandra Hospital, where the Joint Diabetes Antenatal Clinic (JDANC) is held in collaboration with the Academic Department of Diabetes and Endocrinology, by members of the Diabetes research team and JDANC research team.
Participants will be pregnant women who have been diagnosed with their first episode of gestational diabetes (GDM). They will be between 26 and 30 weeks gestation.
All women with an oral glucose tolerance test that is diagnostic of GDM in the Portsmouth region are contacted by the JDANC and typically attend fortnightly clinic visits for the remainder of their pregnancy. Participants fulfilling the eligibility criteria will be informed about the study at the first opportunity, at or before their first visit to JDANC. This contact may be face-to-face or over the phone. For phone contact, participants will be given the opportunity to receive the PIS via email rather than paper, to avoid waiting for postal times for the PIS to arrive. Participants will have at least 24 hours to read the PIS before being recruited into the study. If a patient declines to take part in the study, their routine care in JDANC will be unaffected.

All study visits are designed to be able to fit in with patients' routine visits to JDANC, and all routine clinic care will be performed before or after the relevant study procedures for that week. There may be rare occasions where additional visits are required.

As GDM is inextricably linked to pregnancy, the exact duration of the study may vary between participants. A cut-off recruitment of 30 weeks gestation is intended to ensure that women are in the study for an adequate length of time. The first 2 weeks the 'baseline' period, will be undertaken by all participants. Participants then enter one of 2 arms – this will be for between 4-6 weeks. The final 2 week period may be shortened slightly if women are planned for an early delivery, or go into spontaneous labour (but will need to be at least 7 days to provide adequate data capture).

This study will use the Freestyle Libre flash glucose monitoring system to provide continuous glucose monitoring for participants. There are two versions of this:
1. The standard, 'personal' version is designed to be used in place of finger-prick self-monitoring of blood glucose (SMBG) testing. The sensor is worn for 14 days, and the patient is supplied with

a reader, which is scanned over the sensor and gives a real-time interstitial glucose reading.
2. The 'Pro' version utilises a sensor very similar to the standard version, however this cannot be read by the participant, but is simply worn for 2 weeks and the data downloaded at the end of the 14 day period.

Study visit 1 (week 0)
At this first study visit, the study process will be discussed in full and any questions answered. Eligibility criteria will be confirmed and participants will then be asked to sign a consent form. Participants will have a medical and drug history taken. Venous blood will be taken for HbA1c, if this has not been done at the time of their testing for GDM. Height, weight and blood pressure will be measured.
Participants will all be taught how to perform SMBG with a glucometer (provided) 6 times a day, and shown how to record the results in the glucose diary. A Freestyle Libre Pro sensor will be applied, with participant education about the sensor.
Participants will also be randomised to either the CGM or SMBG arm, although this will not take effect until their next study visit.

Study visit 2 (week 2)
Participants will return to have the Freestyle Libre Pro sensor removed, and adequate data capture on the sensor will be confirmed. The completed glucose diary page will be collected, and any drug therapy recorded. SMBG data will be downloaded.
Participants randomised to the CGM arm will be taught how to use the Freestyle Libre device and will be provided with supplies. Participants in the SMBG arm will continue their current testing regime.

Study visit 3 and 4 (week 4 and 6)
The completed glucose diary pages will be collected, and any drug therapy initiation or changes will be recorded. SMBG data and Freestyle Libre data will be downloaded.
Study visit 4 may be omitted if the participant is to be in the arm for only 4 weeks – if they were recruited at a slightly later stage, or if an early delivery is already planned, to enable the final 2 week study period to take place.

Study visit 5 (week 8)
The completed glucose diary pages will be collected, and any drug therapy initiation or changes will be recorded. SMBG data and Freestyle Libre data will be downloaded.
Participants will be asked to complete a satisfaction questionnaire. All women will continue with SMBG for the remainder of their pregnancy.
A Freestyle Libre Pro sensor will be applied.

Study visit 6 (week 10)
The Freestyle Libre Pro sensor will be removed and adequate data capture will be confirmed. The completed glucose diary pages will be collected, and any drug therapy initiation or changes will be recorded. SMBG data will be downloaded.
This visit may take place while a participant is admitted to the Labour Ward, if either a planned or spontaneous delivery occurs.

For women taking part in the extended sub-group (optional):
Study visit 7 (0 to 3 days post-partum) – a Freestyle Libre Pro sensor will be applied for 14 days
Study visit 8 (2 weeks post-partum) – the Freestyle Libre Pro sensor will be removed. This may be removed by the participant at home and returned in a stamped addressed envelope (provided).

Follow up:
Data will be collected on birth outcome, including mode of delivery, birth weight, premature delivery, any adverse fetal outcomes or neonatal hypoglycaemia.
Data will be collected on participants' 3 month postpartum HbA1c test attendance and result– this is a routine test that will not be undertaken by the study team.

Intervention Type
Device

Primary outcome measure
Difference in mean number of daily glucose readings in CGM group compared to SMBG group measured between weeks 30 to 36 gestation (+/- 14 days); Timepoint(s): End of the study

Secondary outcome measures
The following endpoints will be used for comparisons between the CGM and SMBG groups:
1. Drug (metformin and insulin) doses at each clinic visit
2. SMBG data (downloaded via Diasend) and CGM data (downloaded via Freestyle Libre software)
3. AGP metrics (see below) at weeks 26 to 28 and 36 to 38 gestation (approximately) and postpartum (for extended subgroup)
4. Recorded maternal and fetal adverse outcomes and fetal size after delivery
5. Patient satisfaction questionnaire at week 36 gestation
6. Clinical measurements including HbA1c, weight and height
7. Recorded therapy initiation and dose adjustment at each clinic visit

AGP metrics measured by the Freestyle Libre flash glucose monitor will be used in the endpoint analysis and comparisons:
1. Mean interquartile range
2. Area under the median curve (AUC)
3. Median
4. Time above target range (above 10 mmol/L and above 1 5 mmol/L)
5. Time in target range (TIR) (4-10 mmol/L)
6. Time below target range (below 4 mmol/L and below 3 mmol/L)
7. Median curve instability
8. Specific time periods – including preprandial and postprandial
9. Estimated HbA1c

CGM postpartum sub-group:
Postpartum AGP metrics

Overall study start date
01/10/2017

Completion date
30/09/2019

Eligibility

Key inclusion criteria
1. Female, aged 18 years or above
2. Currently pregnant, and between 26 to 30 weeks gestation

3. Currently diagnosed with first episode of gestational diabetes
4. Are suitable to follow the standard care pathway in JDANC for gestational diabetes and undertake SMBG
5. Participant is willing and able to give informed consent for participation in the study

Participant type(s)
Patient

Age group
Adult

Lower age limit
18 Years

Sex
Female

Target number of participants
Planned Sample Size: 40; UK Sample Size: 40

Total final enrolment
40

Key exclusion criteria
1. Pre-existing known diabetes that is not gestational
2. Previous gestational diabetes
3. Not able to perform SMBG for any reason
4. Previous or current pre-eclampsia
5. Previous or currently diagnosed hypertension
6. Known allergy to Freestyle Libre adhesive pad
7. Planning to move to a geographical area not covered by Portsmouth Hospitals NHS Trust before the end of the study
8. Participating in another study that could interfere with glucose levels or affect ability to participate in this study

Date of first enrolment
18/04/2018

Date of final enrolment
11/01/2019

Locations

Countries of recruitment
England

United Kingdom

Study participating centre

Queen Alexandra Hospital
Southwick Hill Road
Portsmouth
United Kingdom
PO6 3LY

Sponsor information

Organisation
Portsmouth Hospitals NHS Trust

Sponsor details
De La Court House
Queen Alexandra Hospital
Southwick Hill Road
Portsmouth
England
United Kingdom
PO6 3LY

Sponsor type
Hospital/treatment centre

ROR
https://ror.org/009fk3b63

Funder(s)

Funder type
Industry

Funder Name
Mylan Ltd

Results and Publications

Publication and dissemination plan
The results of the study will be submitted for publication in a high-impact peer reviewed journal.

Intention to publish date

Individual participant data (IPD) sharing plan

The data sharing plans for the current study are unknown and will be made available at a later date.

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No