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Individualised patient care and treatment for maternal diabetes

Submission date
23/02/2022

Recruitment status
No longer recruiting

Registration date
25/02/2022

Overall study status
Completed

Last Edited
28/02/2023

Condition category
Nutritional, Metabolic, Endocrine

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

Plain English summary of protocol

Background and study aims
Women with pre-existing diabetes struggle to control their glucose (blood sugar) levels during pregnancy and are at a higher risk of pregnancy complications compared to women without diabetes. Previous studies suggest that glucose levels following mealtimes are key targets for improving overall glucose control but to date evidence is limited regarding the role of diet and nutrition and the generalizability of the blood glucose response to diet across a diverse population. This study aims to investigate these points more closely in a clinical setting with pregnant women with pre-existing diabetes using routine clinical data obtained from continuous glucose monitors (CGM) and two meal interventions.

Who can participate?
Pregnant women (first trimester) with pre-existing type 1 or type 2 diabetes (with or without medication) attending the Diabetes in Pregnancy Clinics at Leeds Teaching Hospitals NHS Trust (LTHT)

What does the study involve?
The study will involve securely sharing medical details regarding health, blood glucose levels, pregnancy, and delivery with approved study researchers. Participants complete questionnaires (by phone) to assess lifestyle and 24 h diet diaries after clinical visits at 10-12, 18-20, and 28-34 weeks of the pregnancy. They consume two assigned meals in duplicate at 18-20 and 28-34 weeks of the pregnancy, permit researchers to analyse urine they provide to the NHS for routine screening, and provide 10 ml of blood on three occasions at 10-12 weeks, 18-20 weeks, and 28-34 weeks of the pregnancy. The participant's decision to participate in the study (or not) will have no effect on her clinical care.

What are the possible benefits and risks of participating?
There are no specific benefits of taking part, but participating in this study will give the researchers important information about how to assess glucose in relation to personal characteristics, pregnancy outcomes, and newborn health, and will help them to better understand how glucose levels change during pregnancy in women with pre-existing type 1 and type 2 diabetes and the role of diet. This will then help to identify and develop new diet strategies to help women reduce their risk of small or large babies, stillbirths, pregnancy

complications, and improve the long-term health of their children.
Although the researchers have designed the meals to not contain allergens and to release the same amount of glucose as participants would usually eat for breakfast there is a possibility that they may experience an allergic reaction or higher glucose levels than normal after the standardised meal consumption. The researchers will check that the participant has no allergies before taking part and ask them to contact the research team if they experience adverse reactions to the meal. Participants will also be advised to monitor and manage their blood glucose levels like they normally would and feel most comfortable with. However, if blood glucose levels and over 18 mmol/l for more than 90 minutes they are advised to administer a corrective dose of insulin or contact their GP/clinical care team and inform a member of the research team via email. The meals are designed to minimize the risk of high blood sugar. Blood sample collection is part of routine clinical care and will be performed by qualified clinical staff, so any discomfort should be minimal.

Where is the study run from?
University of Leeds (UK)

When is the study starting and how long is it expected to run for?
October 2020 to June 2023

Who is funding the study?
Wellcome Trust (UK)

Who is the main contact?
Cassy Dingena
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Contact information

Type(s)
Scientific

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
297276

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
CPMS 50813, IRAS 297276

Study information

Scientific Title

Understanding the glycaemic profile of maternal diabetes using continuous glucose monitoring: intensive glucose profiling to inform patient care and treatment (INFORMED)

Study objectives

A. Main research question: How do diet and personal factors influence glucose responses in pregnant women with pre-existing diabetes?
1. What role does diet play as a mediator of dysglycemia over the course of pregnancy?
Hypothesis: Pregnant women with pre-existing diabetes consuming a well-balanced diet (e.g. low glycemic index, reduced saturated fat and high fibre intake) will have improved glycemic control and reduced dysglycemia over the course of pregnancy compared consuming to an unbalanced diet (e.g. high glycemic index, increased saturated fat and low in fibre intake).
2. Which personal characteristics drive differences in dysglycemia?
Hypothesis: Personal characteristics such as younger age, lower body mass index and non-minority ethnic background will have a positive impact on (dys)glycemia in pregnant women with pre-existing diabetes.
B. Nested study: How do diet and personal factors influence glucose responses after a meal in pregnant women with pre-existing diabetes?
1. What role does diet play as a mediator of post-prandial glucose response over the course of pregnancy?
Hypothesis: Pregnant women with pre-existing diabetes consuming a standardised breakfast meal replacement with a low glycemic index will have improved glycemic control after the meal over the course of pregnancy compared to consuming a standardised breakfast meal replacement with a high glycemic index.
2. Which personal characteristics drive differences in dysglycemia after a meal?
Hypothesis: Personal characteristics such as younger age, lower body mass index and non-minority ethnic background will have a positive impact on (dys)glycemia after a meal in pregnant women with pre-existing diabetes.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 17/12/2021, North East - Tyne & Wear South Research Ethics Committee (NHSBT Newcastle Blood Donor Centre, Holland Drive, Newcastle upon Tyne, NE2 4NQ, UK; +44 (0) 2071048306, +44 (0)2071048285, +44 (0)2071048265; tyneandwearsouth.rec@hra.nhs.uk), REC ref: 21/NE/0196

Study design

Randomized; Interventional; Design type: Treatment, Dietary

Primary study design

Interventional

Study type(s)

Other

Health condition(s) or problem(s) studied

Diabetes mellitus

Interventions

This study aims to determine if diet is an effective way to manage glucose levels during pregnancy in a diverse population of pregnant women with diabetes. To investigate this, the researchers will recruit pregnant women with pre-existing type 1 or type 2 diabetes. The majority of the information required for this study is routinely collected by the NHS during routine clinical visits for pregnant women. No special additional visits to a hospital or clinic are required for the study. The participants' commitment to the study requires their consent: (i) for study researchers to access the participants' existing NHS clinical records to extract specific information about the individual and their pregnancy; (ii) offer researchers access to their clinical urine sample for analysis; (iii) provide an additional blood sample (10 ml) at three clinical visits; and (iv) to perform specific tasks in their own home related to diet and physical activity that they are comfortable with (outlined below).

Study design:
This study has two components: 1) an observational longitudinal study using routinely collected clinical data and lifestyle questionnaires to understand how daily dietary patterns associate with CGM glucose patterns; and 2) an optional nested cross-over dietary intervention study to compare two specially designed meals, that differ in carbohydrate quality, to evaluate the effect of carbohydrate quality on CGM glucose response at different stages of pregnancy (early and late gestation).

Study procedure:

1) Observational longitudinal study:
The study will involve (i) securely granting access to routinely collected clinical details regarding health, continuous glucose monitoring (CGM) data, pregnancy, and delivery by authorised study researchers; (ii) permitting researchers to use the residual urine from routine clinically collected samples for metabolic analysis; (iii) questionnaires to assess diet and lifestyle during each trimester at ~10-12 weeks, ~18-20 weeks, and ~28-34 weeks ; and (iv) allowing an extra 10 ml blood sample to be taken with routine clinical bloods at ~10-12 weeks, ~18-20 weeks, and ~28-34 week visits for storage and subsequent metabolomic and genetic analysis. The study will take place at (i) St James's Hospital (LTHT) and (ii) the participant's home.

i. St James's Hospital
All pregnant women with pre-existing type 1 diabetes (T1D) or type 2 diabetes (T2D) are scheduled for regular NHS clinical visits every ~2 weeks throughout the pregnancy. Each woman has an assigned diabetes midwife who 'caseloads' her pregnancy and liaises with the rest of the direct clinical care team. Due to COVID-19, pregnant women currently only attend face-to-face meetings at the clinic when due for a scan (~10-12 weeks 'dating' scan; ~18-20 weeks 'anatomy' scan; ~26-28, ~32-34, and ~36 weeks for 'growth' scans). All women with T1D and T2D are started on CGM at their 1st clinical visit to help them manage their diabetes during pregnancy. These devices record glucose every 5 minutes across the full 24 hours, every day throughout the pregnancy. The glucose information is automatically uploaded to a remote NHS shared clinical database (electronic patient platform), where it can be accessed by the clinical team or authorised researchers. The database allows clinical reports about glucose to be downloaded, as well as the ability to export raw glucose data as a .csv file. Additionally, at routine visits during the pregnancy, the clinical care team will collect information regarding the patient's health during pregnancy, such as blood pressure, body weight, height, to monitor their health. The researchers are asking for access to this routinely collected clinical data, so that they can see how the patient's health before and during pregnancy affects their glucose levels.

Additionally, the researchers will request access to routinely collected data on postnatal pregnancy outcomes to assess dysglycemia in relation to pregnancy outcomes. Using routinely

collected data minimises the burden on the participant and research costs for the NHS. The women have blood samples taken routinely, monthly throughout pregnancy to assess glycaemic control (e.g. HbA1c). On these routine visits, when the clinical team collects their blood samples, they ask for an extra 10 ml of blood to be collected for specific research analysis, including metabolic and genetic analyses related to diet/glucose control/fetal growth. Finally, urine samples are routinely collected by the clinical care team to perform dipstick testing for urinary protein. Rather than dispose of the waste urine sample the researchers will ask to retain this for subsequent analysis of dietary metabolites. Together, blood (circulating) and urine (waste) metabolite analysis provides an overall perspective of metabolism in the body. Participants can opt out of specific or both metabolite analyses. This information will allow the researchers to better understand the reason why women respond differently to dietary interventions.

For clarity, the clinical care team is solely involved in the initial recruiting of the participants by notifying the patient about the study providing the infographic, which will take place during their first clinical routine 'dating scan' visit, collecting study blood samples and granting access to the specified patient data. Potential participants will not be directly approached by a member of the University of Leeds research team. All the (medical) data described above is collected during routine care and we, the research team at UoL, will be asking for the patient's consent to access the specified data using the electronic platform used by LTHT. The member of the research team (Dingena) having access to the patient data will have a research passport. This member of the research team will get access to the electronic patient platform, but only the previously specified and consented patient data. The accessible sections of the medical record by the research team at UoL will be authorised by a member of the clinical care team. The clinical care team will not be asked to do any procedures outside the scope of routine clinical care.

ii. At the participant's home
Each participant will be contacted three times over the phone or video chat (whichever they prefer) for 30 mins each, within ~2 weeks of each clinical appointment at ~10-12, ~18-20, and ~28-34 weeks.

Call #1: (i) a member of the research team will discuss the study with the participant and walk them through from start to finish and answer any remaining questions, (ii) instruct them how to and tell the participant to record their food intake over 3 days (2 weekdays and 1 weekend) using the myFood24 app, (iii) discuss/review the participant's physical activity levels, and sleep quality/patterns (no advice or direction will be offered)(questionnaires provided as supplemental documents in this application), (iv) some of the time will be spent discussing the contents, preparation, purpose of standardized, timings of the meals (see below) and potential risks. (v) and remind them that the participant can email the study researcher (email address in the PIS) with any questions.

Call #2: (i) a discussion about how the participant is doing regarding the study, (ii) a summary of what the next stage includes, (iii) a review of their physical activity levels, sleep quality/patterns and habitual mealtimes, (iv) a reminder and summary of when and how to consume the first set standardised meals.

Call #3: (i) a discussion about how they are doing regarding the study, (ii) a reminder and summary of when and how to use the myFood24 app, (iii) a review of their physical activity levels, sleep quality/patterns and habitual mealtimes, (iv) a reminder and summary of when and how to consume the second set of standardised meals (v) and the conclusion of their active role in the study, what it has achieved, and our thanks and best wishes. The researchers will not contact the participant beyond 34 weeks of gestation.

2) Nested cross-over intervention study:
Shortly after their ~18-20 week and ~28-34 week clinical visit, participants will be asked to consume standardised breakfast meal replacements in their own home, at breakfast time for 4 days. These will be two different meal replacements (A and B; matched for calorie, fat, protein, and micronutrient) under free-living conditions. The meals will appear and taste similar and differ only in glycemic index (e.g. how quickly the glucose in the meal is absorbed in the blood). One meal will have added sugars and have a higher GI that is comparable to commonly consumed breakfast cereals (e.g. corn flakes or instant porridge or white breads; GI≈80), while the other meal will have added non-digestible carbohydrates (e.g. soluble fibres) and have a lower GI that is comparable to commonly consumed wholegrain breakfast cereals (e.g., steel-cut or rolled oats; GI≈40). Meals will be pre-packaged (labelled A or B) with a drink shaker in a box by the research team in a COVID-safe lab. Each participant will be given a randomly assigned order to consume the breakfasts (e.g. AABB, ABAB, BBAA, etc) over 4 days using an online randomiser (https://www.random.org/integer-sets/). The participant will only need to pour the powder into the shaker, add cold water to the line marked on the cup (500 ml), and consume within 5 min. The powder will provide a complete meal in drink and is naturally low in carbohydrates, which will make it easier to manipulate in carbohydrate content. Moreover, the product is widely consumed in the general public and approved by registered dieticians and nutritionists. They will be asked to avoid consuming other foods and drinks (aside from water) for two hours, after which they may consume food as usual. They are permitted to measure their own blood sugar levels at any point and will be advised to manage any hyperglycaemic or hypoglycaemic event as normal, even if these means eating or drinking within 2 hours of the meal. The researchers will ask that the participants inform of any events by emails as soon as possible. However, if blood glucose levels surpass >18mmol/l for more than 90 minutes they are advised to administer a corrective dose of insulin or contact their GP/clinical care team and inform a member of the research team via email. The meals are designed to minimize risk of hyperglycaemia. They will be advised to monitor and manage their blood glucose levels like they normally would and feel most comfortable with.

Study population:
Women with T1D and T2D during pregnancy will be recruited from the Diabetes in Pregnancy Clinics at Leeds Teaching Hospitals NHS Trust (LTHT). There is no current evidence regarding the association between dietary carbohydrates or glycemic index on metric of CGM in diabetic pregnant women. However, there is existing evidence from Fabricatore et al (2011) which reports a significant ($p < 0.05$) association between self-reported glycemic index and measures of CGM (including AUC, mean glucose, and % time hyperglycemic) in a clinical trial of 26 overweight/obese adults (21 women and 5 men) with type-2 diabetes. Assuming similar effect sizes and correlations of GI (per unit) on AUC glucose ($\beta = 0.36$ mg/dl/min; $r2 = 0.38$), mean glucose ($\beta = 0.02$ mol/l; $r2 = 0.38$), and time >10 mol/l glucose ($\beta = 0.41\%$; $r2 = 0.36$), the study will be well powered ($1- \beta = 0.90$) to detect a significant pairwise effect of GI (per unit) on these parameters with 63 participants. Additionally, Law et al (2019) in their CGM study (based in Leeds) with 162 women with pregnancy-induced diabetes (i.e., gestational diabetes) suggest that the study will be well powered ($1- \beta = 0.90$) to compare subgroups of participants (stratified by BMI, age, type of diabetes) and test for significant differences (of a minimum effect size) in mean glucose (± 0.5 mmol/L), AUC glucose (± 61 mmol/L/min), and % time hyperglycaemic (± 3.7 %). Finally, given the comparable proportions of women reported to be of white European vs non-white European descent (57% vs 43%) or diet vs diet+ medication (46% vs 54%) the researchers also anticipate having adequate power to compare these confounders of glycemic response. To account for attrition, they will increase the recruitment target by 20% above the calculated, suggesting a target sample size of 76 recruited women (see power analyses). The researchers have allocated ~6 months to recruit 76 women and ~15 months for study completion.

Methodology

A member of the research team (Dingena) will provide a unique random screening ID for the recruitment phase. After recruitment, all data obtained for this study (incl. patient data and questionnaires) will be pseudonymized using personal participant identification numbers (PID), which is the unique random study ID generated by a member of the research team (Dingena), specifically for this study. Only authorised members of the research team (Dingena and Zulyniak, i.e. to coordinate the study, and Clement, i.e. anonymisation of the tissue samples) and study regulatory authorities (i.e. for official check-ups) will be able to link the study ID to the participant.

All clinical data is collected for routine care and will be uploaded on the electronic patient platform by the clinical care team. After consent is obtained from the participants, a member of the research team (Dingena) having a research passport will get access to the online patient platform, but only to the specified data.

Clinical data – maternal anthropometric, glycaemic, medication, and blood pressure information is recorded during routine hospital visits and during and after labour. Offspring anthropometry measures are taken by the clinical care team, which is part of routine care. The women will be asked to give consent for the research team to access their clinical records to obtain this data.

CGM – as this is included as standard clinical care in T1D and T2D pregnancies, women will be asked to give consent for the research team to access their CGM data (see consent form).

Urine samples – as these are collected as standard clinical care, the researchers will ask for up to 2.5 ml of any urine not required for clinical analysis to be saved for research use. These samples will be anonymised and processed by a member of the research team (Dr Naomi Clement) for subsequent metabolic analysis (see Consent form). All samples will be stored at the University of Leeds in designated Human Tissue Act approved and compliant facilities (Food Science or LICAMM).

Blood samples - are taken as part of standard clinical care (e.g. HbA1c analysis) and at the same time, an additional 10 ml of blood will be collected by the clinical care team, specifically for this study (one additional sample at each trimester). These study blood samples will be anonymised, processed and stored by a member of the research team (Dr Naomi Clement) for subsequent metabolic and genomic analysis (relevant to nutrition/diabetes/pregnancy and fetal growth) (see Consent form). All samples will be stored at the University of Leeds in designated Human Tissue Act approved and compliant facilities (Food Science or LICAMM).

Lifestyle questionnaires and dietary information – at three timepoints across pregnancy at ~10-12, ~18-20, and ~28-34 weeks gestation, during the phone calls the member of the research team will complete the questionnaires on physical activity, and sleep quality/patterns together with the participant. Additionally, participants will be asked to track their diet for 3 days (2 weekdays, 1 weekend day) at ~18-20 and ~28-32 weeks of gestation using an online food frequency questionnaire (MyFood24) accessible via personal computer/laptop, tablet or smart phone. MyFood24 is a nutritional intake analysis software for use in research, teaching and healthcare settings, developed by researchers and tested with different age groups. MyFood24 helps to log dietary intake using a website or app with a detailed range of food items, recipes, and information on portion sizes. The tool has been validated in the UK against a suite of independent nutrient reference measures, including urinary and plasma biomarkers as well as interview-led dietary recalls. One of the lead researchers (Dingena) will anonymise all questionnaire data using the PIDs.

Researcher bias:
All participants will receive standard clinical care as per NICE guidance during their pregnancy, which will minimise researcher bias. The primary outcome measures are based largely on laboratory measurements and predetermined cut-off values, which the researchers will not be able to influence. The researchers do not foresee significant researcher bias in collecting antenatal and perinatal outcome data because these will obtained from the participants' medical records as standard practice. They do not foresee any significant researcher bias in collecting lifestyle records, as standardised and validated questionnaires will be used to obtain this information.

Interim analysis/reports:
There is no formal interim analysis planned except the ongoing evaluation of the recruitment numbers. Preliminary results may be reported in Peer-reviewed journals or original communication outputs at relevant conferences.

Study management:
A steering group comprised of the PI, CoI's, and the clinical study coordinator, will oversee the study and meet every month. They will meet via virtual call at the start and monthly meetings will be scheduled between the research team and clinical investigator. Project management responsibilities will be shared by all investigators. A member of the research team will liaise with the clinical study coordinator at the site to ensure timely overall recruitment, clinical data collection, and data fidelity.

Special consideration:
The study has been designed to minimise the risk of COVID-19 transmission by eliminating direct contact between research staff and participants. Consent and all forms will be completed and submitted online by each participant in their own home, with all communication taking place over the phone or the internet. The standardised meals will be packaged in a COVID-safe environment and delivered securely to a location of the participants choosing.

Intervention Type
Device

Phase
Not Applicable

Primary outcome(s)
Measures of (dys)glycaemia (e.g. CGM data, HbA1c) accessed at approximately 10-12, 18-20, and 28-34 weeks' gestation

Key secondary outcome(s))
1. Medical details of health, pregnancy, and delivery collected via routine care at the diabetes in pregnancy clinic at Leeds Teaching Hospitals NHS Trust on three occasions at ~10-12, 18-20, and 28-34 weeks of gestation
2. Lifestyle information:
2.1. Maternal dietary intake recorded using the myFood24 app over 3 days (2 weekdays and 1 weekend)
2.2. Physical activity and sleep recorded using Pregnancy Physical Activity Questionnaire (PPAQ) and Leeds Sleep Evaluation Questionnaire (LSEQ) questionnaires, respectively, on three

occasions at ~10-12, 18-20, and 28-34 weeks of gestation
3. Metabolomics and genetic analysis using urine and blood samples on three occasions at ~10-12, 18-20, and 28-34 weeks of gestation

Completion date
01/06/2023

Eligibility

Key inclusion criteria
1. Women aged 18-45 years
2. Singleton pregnancy
3. Pregnant women in the first trimester of pregnancy
4. Diagnosed with either type 1 or type 2 diabetes mellitus

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Upper age limit
45 years

Sex
Female

Key exclusion criteria
1. Women aged under 18 or above 45 years
2. Women presenting after 14 weeks gestation
3. Multiple pregnancy
4. Foetal congenital abnormality
5. No diagnosis of diabetes
6. Diagnosis of gestational diabetes
7. Significant co-existent medical condition (e.g. overt diabetes complications, cancer, gut mobility or digestion disorder)
8. Significant psychological (e.g. anorexia, bulimia) and/or mental disorders which undermines informed consent
9. Dietary allergies or intolerance (for the standardised meals
10. Lack of internet access on a computer or tablet at home
11. Unable to understand written English and provide informed consent

Date of first enrolment
01/04/2022

Date of final enrolment
01/05/2023

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
St James' University Hospital
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Study participating centre
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Sponsor information

Organisation
University of Leeds

ROR
https://ror.org/024mrxd33

Funder(s)

Funder type
Research organisation

Funder Name
Wellcome Trust; Grant Codes: 217446/Z/19/Z

Alternative Name(s)
Wellcome, WT

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study will be stored in a non-publicly available repository

In the first instance, the researchers will use data collected by the direct clinical care team of the participants at the Leeds Teaching Hospitals NHS Trust. During routine pregnancy visits across gestation a continuous glucose monitor (CGM) will be inserted into the patient's arm - this is routine care for pregnant women with diabetes and will collect blood glucose levels every 5 min. Additionally, the clinical care team will collect medical information, such as blood pressure, body weight, height, lipid levels as part of standard practice. The researchers will be able to access the raw data, any further analysis will be done by the research team. All this data is collected for routine care and will be uploaded on the electronic patient platform by the clinical care team. After consent is obtained from the participants, a member of the research team (Dingena) having a research passport will get access to the online patient platform, but only to the specified data. An additional blood sample will be collected by the clinical care team at three clinical visits (week ~10-12, ~ 18-20 and ~28-34) and anonymised/processed by Dr Naomi Clement (a member of the research team) and stored at UoL for more specific analysis, including metabolic and genetic analyses.

At home, the participants will complete questionnaires about their physical activity and sleep quality, these will be conducted during the phone calls at week ~10-12, ~ 18-20 and ~28-34 of the pregnancy. Dietary information will be obtained using an online dietary tracker called MyFood24. Data on physical activity, sleep quality, and diet will be recorded and shared electronically using MS One Drive – UoL account. To gain more insight into mealtime glucose responses, participants will consume standardised meals. The impact of meals on glucose will be recorded by the CGM devices, an authorised member of the research team (Dingena) will access this is data using the online patient platform.

Analyses will involve the analyses of CGM data to identify (i) patterns of dysglycemia in high-risk pregnancies, (ii) early predictors of heightened mealtime dysglycemia, and (iii) confounders of risk (e.g., diet, BMI, ethnicity, and age).

The research team (Dingena) will provide a unique random screening ID for the recruitment phase, this code link will be stored securely on MS OneDrive and will only be accessible to a

member of the research team (Dingena) involved in the recruitment/eligibility checks phase. Personal details of prospective participants not progressing to the full study will be permanently deleted. The recruitment phase code link will be destroyed immediately after the eligibility checks.

After recruitment/eligibility checks, a member of the research team at UoL (Dingena) will assign a unique random study ID to each eligible participant. The study ID will be used to pseudonymise (using personal participant identification numbers [PID]) all data downloaded from the electronic patient platform by the research team (medical and CGM data) and all data obtained by the research team at UoL (screening and lifestyle questionnaires). Only authorised members of the research team (Dingena and Zulyniak, i.e. to coordinate the study, and Clement, i.e. anonymisation of the tissue samples) and study regulatory authorities (i.e. for official check-ups) will be able to link the study ID to the participant.

The medical record data will be collected and uploaded on the electronic patient platform by the clinical care team, this is part of the routine care. After consent is obtained from the participants, one member of the research team (Dingena), having a research passport, will get access to the online patient platform, but only to the protocol-specified data. All anonymised research data will be stored in secure, password-protected computer files set up on the research laptops at UoL)(MS Access and CSV files). This anonymised research data will be regularly replicated for long term storage to the data management centre (MS OneDrive - UoL account). After 15 years this anonymised research data will be destroyed.

All personally identifiable information, such as date of birth, contact details and consent forms, will be stored for 5 years in a password-protected database on
the secure servers of UoL (MS OneDrive). Similarly, all collected blood samples and urine samples will be anonymised using the PID and stored at the University of Leeds in designated Human Tissue Act approved and compliant facilities at Food Science or LICAMM.

IPD sharing plan summary

Stored in non-publicly available repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		27/02/2023	28/02/2023	Yes	No
HRA research summary			28/06/2023	No	No
Participant information sheet	version 21	03/11/2021	25/02/2022	No	Yes
Participant information sheet	Infographic version 1.0	09/08/2021	25/02/2022	No	Yes
Participant information sheet	version 2.0	03/11/2021	02/03/2022	No	Yes