

MEDIA RELEASE

SMARTPHONE APP HELPS CONTROL BLOOD SUGAR AND LESSEN COMPLICATIONS IN NEWBORNS AMONG WOMEN WITH GESTATIONAL DIABETES

SMART-GDM the largest randomised controlled trial to date focusing on the use of mobile technologies in supporting management of blood sugar levels in women with GDM, and first to demonstrate associated reduction in adverse outcomes among newborns

SINGAPORE — Clinical researchers from the National University Hospital (NUH) have found that a smartphone app-based lifestyle coaching programme designed for women with gestational diabetes mellitus (GDM) is effective in controlling blood sugar and preventing GDM-related complications among newborns. The research study, titled SMART-GDM, was based on a clinical trial conducted among some 340 pregnant women in Singapore enrolled between September 2017 to November 2018.

GDM is a category of diabetes that affects women during pregnancy, where the sugar level in the blood is too high. In most cases, GDM develops in the middle or towards the end of pregnancy, and resolves after giving birth. The condition is common and affects about one in five pregnant women in Singapore.

Poor control of blood sugar level during pregnancy increases the risks of complications. It is associated with higher risks of preterm birth, caesarean section, and high blood pressure that develops in pregnancy (pre-eclampsia). Babies may grow larger than average for their gestational age (macrosomia) and may have low sugar levels after birth, which would require additional care in the neonatal unit. Women with GDM are more likely to develop diabetes later in life.

Good blood sugar control has been shown to reduce complications. In most situations, having a healthy diet and regular exercise will be enough to control GDM. A dietitian will work with the patient on an individualised healthy eating plan. The patient will also be taught by a diabetes nurse on how to monitor her blood sugar level at home, and will be given a chart to note down her readings. Medication may be given if the blood sugar levels are not controlled even with diet and exercise.

However, patients may face certain challenges in their journey to control GDM. While they are supported to carry out self-care through face-to-face consultations and lifestyle intervention programmes, these activities are often resource-intensive and might not be delivered in a timely manner as patient support and feedback typically occur only during consultations. The manual recording of readings in a paper diary may be inaccurate or incomplete. Patients may not recall their activities leading to fluctuations in their blood sugar levels, by the time the results are discussed with the nurse or doctor. They may also be overwhelmed by the amount of information given during the face to face sessions, and do not know how to contact the nurse or the doctor if they need to.

Promoting self-management and monitoring

To address these challenges, NUH has partnered medical technology firm Jana Care to co-develop Habits-GDM, a largely automated smartphone app-based lifestyle coaching programme designed to equip women with GDM with the means to independently manage and monitor their own condition. The programme also takes into consideration the nutritional requirements and exercise restriction during pregnancy, as well as the need to prevent excessive gestational weight gain.

Dr Yew Tong Wei, Consultant, Division of Endocrinology, NUH and Principal Investigator of the SMART-GDM study, said, “The widespread use of smartphones provides a promising opportunity to harness technology to improve diabetes care and self-management. Studies, including our own interviews of women with GDM, have found that women of childbearing age accept and prefer web-based and smartphone app-based support for diabetes management. They are also generally highly-motivated and driven by concern for the well-being of their babies.”

Women who were diagnosed with GDM¹ between 12-30 weeks of gestation and had completed face-to-face GDM education sessions as part of usual care were eligible for the trial using Habits-GDM. In addition to usual care, participants in the intervention group downloaded the app and were given a glucometer and a Bluetooth weighing scale that was linked to the app. Participants were prompted by automated messages to measure their blood sugar and weigh themselves regularly.

The programme comprises 12 interactive lessons, diet, self-monitoring of blood sugar, physical activity and weight tracking tools, and messaging platform with healthcare professionals. The content was co-developed by endocrinologists, obstetricians, diabetes educators and dietitians in NUH. The lessons content were similar to the in-person education provided to both study arms, with additional modules on gestational weight gain, and more detailed dietary and physical activity guidance. Provided in bite-sized modules, participants could go through the lessons at their own pace and revisit them whenever they wished.

A database of common foods in Singapore was also incorporated into Habits-GDM, and participants were cued via automated messages to record their diet. The app also has a manual chat function where the participants may pose questions and the healthcare team would respond within 24 hours. The healthcare team did not reach out proactively through this function as most of the coaching was designed to be automated.

Study outcomes

The SMART-GDM study shows that the use of a smartphone app-based lifestyle coaching program designed specifically for women with GDM can help in better control of blood sugar, when added to usual care. This is associated with fewer adverse outcomes among the newborns, even when excessive gestational weight gain is not impacted.

¹ GDM was diagnosed if there was at least one abnormal plasma glucose (≥ 5.1 , 10.0 and 8.5mmol/L for fasting, 60-minute and 120-minute respectively), after a 75g oral glucose tolerance test (OGTT).

The average blood sugar readings were lower in the intervention group compared to the control group, with no differences in the frequency of self-monitoring of blood sugar. The proportions of blood sugar above targets were also significantly lower in the intervention than control group. There was no significant difference among the participants with respect to the proportion with excessive gestational weight gain and absolute gestational weight gain by the end of pregnancy.

Overall neonatal complications were significantly lower in the intervention group (38.1%) than control group (53.7%). A total of 152 infants (64 intervention, 88 control) experienced at least one of the specified neonatal complications.

Dr Yew noted, “SMART-GDM is the largest randomised controlled trial to date focusing on the use of mobile technologies in supporting the management of blood sugar level in women with GDM. It is also the first to demonstrate an associated reduction in adverse outcomes among newborns. The findings are especially timely given the prominence telemedicine has received in view of the COVID-19 developments. While the mobile app cannot entirely replace the healthcare professional as the medical needs of each individual are unique, the technology-enabled coaching channel can empower the patient in self-care and monitoring, and cut down on frequent hospital visits.”

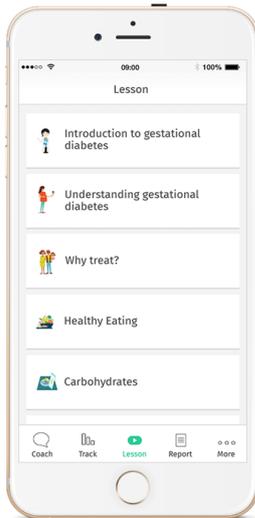
The clinical study was published in *Diabetes Care*, one of the highest-ranked peer-reviewed journals in the field of diabetes and endocrinology, on 13 July 2020. The paper is accessible at the following URL: -

<https://care.diabetesjournals.org/content/early/2020/11/05/dc20-1216>

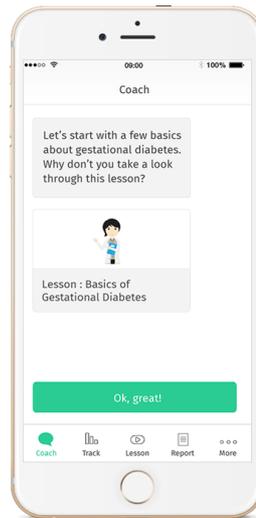
About the Mobile App

Screenshots

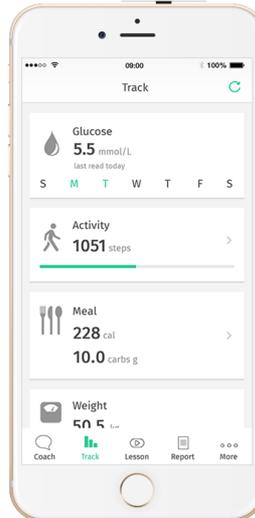
Intervention: Habits-GDM app



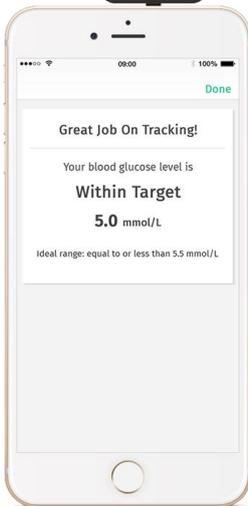
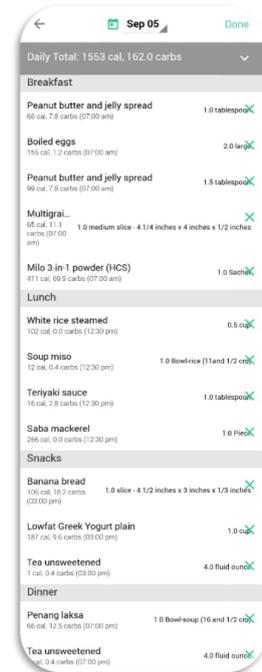
Lessons



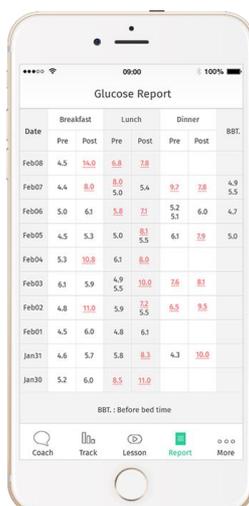
Coach



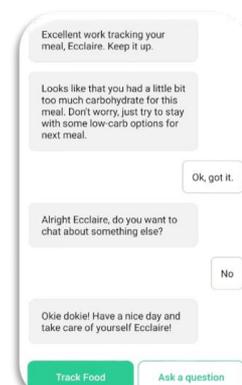
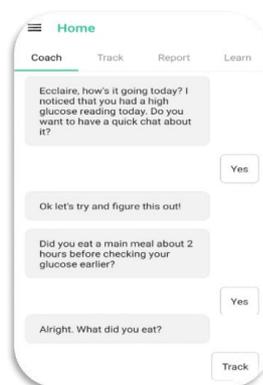
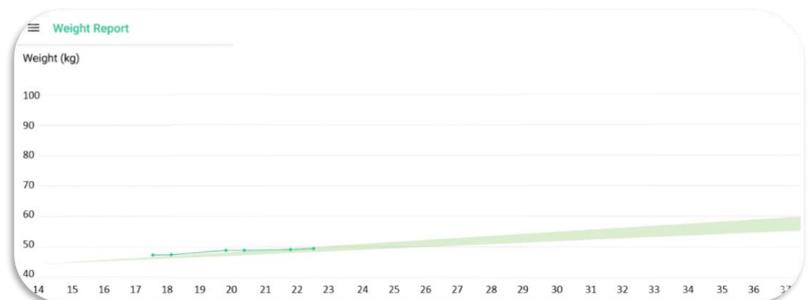
Tracking



Feedback



Report



Chinese Glossary

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About the National University Hospital

The National University Hospital is a tertiary hospital and major referral centre with over 50 medical, surgical and dental specialties, offering a comprehensive suite of specialist care for adults, women and children. It is the only public hospital in Singapore to offer a paediatric kidney and liver transplant programme, in addition to kidney, liver and pancreas transplantation for adults.

The hospital was opened on 24 June 1985 as Singapore's first restructured hospital. Each year, the Hospital attends to more than one million patients.

As an academic health institution, patient safety and good clinical outcomes are the focus of the Hospital. It plays a key role in the training of doctors, nurses, allied health and other healthcare professionals. Translational research is pivotal in the Hospital's three-pronged focus, and paves the way for new cures and treatment.

A member of the National University Health System, it is the principal teaching hospital of the NUS Yong Loo Lin School of Medicine and the NUS Faculty of Dentistry.