

# Adaptation of the IDF WINGS programme for Hyperglycaemia in Pregnancy in Guyana, South America.

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## Abstract

Objective: Introduced of a protocol for the outpatient management of hyperglycaemia in pregnancy (HIP) in Guyana based on the IDF WINGS programme Design: Quality improvement programme and education intervention Setting: The national referral hospital in Georgetown (GPHC) and two associated community health centres (HC). Population: Pregnant women of <37weeks gestational age. Methods: An inter-professional team of clinical leaders introduced universal screening for gestational diabetes (GDM) using a 75gm OGTT and simplified outpatient management of HIP with self-monitoring of blood glucose, diet followed by metformin then insulin. Main Outcome Measures: Numbers of women screened, diagnosed and treated for HIP. Results: Between November 2016 and 1st July 2019, 2226 pregnant women were screened, 461 (25.9%) were abnormal at GPHC and 12 (2.6%) at the HC. Forty-four% were treated with medical nutritional therapy alone, 43% required metformin and 13% received insulin. Caesarian section rates were high (46%) and attendance for postpartum OGTT poor (15%). Conclusions: The high rate of positive tests at GPHC is consistent with the system of transferring high risk patients to GPHC. Before supporting a nationwide universal screening programme, further investigation is required, eg screening for GDM at regional hospitals and HC outside the immediate GPHC catchment. Our results suggest universal screening may not be the only choice for the populations of low-and-middle income countries. Funding: World Diabetes Foundation (WDF) and the Banting and Best Diabetes Centre (BBDC) of the University of Toronto. Keywords: Hyperglycaemia in pregnancy, diabetes, oral glucose tolerance test.

## Tweetable abstract

Screening and management for hyperglycaemia in pregnancy was successfully started in Georgetown Guyana within local resources.

## Introduction

The former British colony of Guyana on the northern coast of South America identifies culturally with the Caribbean and shares many of its health problems including the risk of diabetes. It has a multi-ethnic population with about 40% Indo-Guyanese descendants of indentured servants, about 30 % Afro-Guyanese descendants of slaves and small numbers of Chinese, Europeans (mostly Portuguese) and Amerindians as well as those of mixed race. All are at high risk of diabetes. A recent national survey [1] showed a national prevalence of 14.9% with higher rates amongst women.

Healthcare is a fundamental right guaranteed in Guyana's constitution and free at the point of care. Ninety-two percent of women get at least one ante-natal visit and have a skilled attendant at childbirth [3]. Hyper-

glycemia in pregnancy includes women previously diagnosed with types 1 and 2 diabetes, those with undiagnosed diabetes, and those with diabetes arising in pregnancy (gestational diabetes mellitus(GDM))[4]. Since diabetes is often undiagnosed in adults, and few women are tested for GDM, the prevalence of hyperglycemia in pregnancy is also often unknown [4]. Known and previously undetected diabetes in pregnancy increase the risk of high blood pressure, large birth weight babies and obstructed labour [5] as well as an increased risk of foetal malformations, foetal loss, perinatal, neonatal and maternal mortality. While GDM has lower risk for the offspring, as many as half the women with a history of GDM go on to develop type 2 diabetes within five to ten years after delivery [6].

WHO does not have a recommendation on whether or how to screen for GDM and considers screening strategies for GDM a priority area for research, particularly in low-and-middle income countries (LMICs)[7]. The American Diabetes Association and many other national diabetes organisations in developed countries recommend testing for undiagnosed diabetes at the first prenatal visit in those with risk factors and testing for gestational diabetes mellitus at 24–28 weeks of gestation in pregnant women not previously known to have diabetes [8].

The International Diabetes Federation has called gestational diabetes (GDM) “a severe and neglected threat to child and maternal health” [4]. They recommend that “pregnant women with diabetes or at high risk of GDM should manage their glycaemia throughout their pregnancy to avoid long-term consequences for themselves and their children and the transgenerational effects (higher risk of obesity, diabetes, hypertension and kidney disease in the offspring).” Consequently, women diagnosed with GDM require enhanced clinical care, and support for health behaviour changes to reduce adverse pregnancy outcomes for themselves and their babies. When introducing universal screening, education and support are needed for both staff and pregnant women who may be quite unfamiliar with the methods used to diagnose and manage hyperglycaemia in pregnancy.

As part of a long-standing collaboration between the Banting and Best Diabetes Centre (BBDC) of the University of Toronto, the Ministry of Public Health (MOPH) and Georgetown Public Hospital Corporation (GPHC), the national referral and teaching hospital to improve diabetes care, we introduced a programme for the diagnosis and outpatient management of hyperglycaemia in pregnancy at GPHC and two associated health centres (HC). It is estimated about 50% of deliveries in Guyana take place at GPHC [9]. WONDOOR Global Health Program of the University Hospitals, Cleveland, Ohio which supports specialty obstetric training at GPHC[10] also collaborated. Prior to the introduction of this programme, pregnant women were screened for HIP only on an ad hoc high-risk basis and if positive transferred to GPHC for in-patient management with insulin.

Ethics approval for the whole Guyana Diabetes Care Project was provided by the University of Toronto (number 32091). As this was considered programme development no local ethics approval was required.

## Methods

This was a quality improvement programme and education intervention evaluated with collection of quantitative outcomes data illuminated by qualitative sub-studies.

### Eligibility criteria:

Women who were pregnant and less than 37 weeks gestational age, presenting for the first time in pregnancy at the participating health facilities (GPHC and 2 associated health centres) were included.

Pregnant woman with type 1 diabetes or known type 2 diabetes and those with metabolic decompensation due to diabetes who needed urgent management were excluded.

### Interventions:

Diagnostic and management algorithms were developed in collaboration with GPHC obstetricians based on the IDF WINGS programme (see Table 1) [11]. The programme was introduced at GPHC where most of the women seen are considered to have high risk pregnancies for one reason or another, and then rolled out to

two associated health centres where routine antenatal care is provided. As it was anticipated that universal screening for GDM would detect milder degrees of hyperglycaemia and to avoid the burden of unnecessary admission to hospital, metformin was added to the IDF WINGS management of standard medical nutrition therapy, and home self-glucose monitoring. This is consistent with FIGO guidelines[12].

### **Staff and Patient awareness and education**

Obstetric staff, residents and senior midwives attended a teaching session provided by a Canadian endocrinologist experienced in hyperglycaemia in pregnancy. Over the next 2 years they then provided teaching to a further 59 doctors and nurses including 12 in the Family Medicine Residents training programme fostering a team approach to care.

Educative talks were given to pregnant women at GPHC and 2 participating health centers. Nutritional pamphlets and booklets adapted from IDF Wings programme were distributed to GDM patients. A survey of a convenience sample of clinic patients was conducted to assess women's perceptions of the education and screening and the impact of any SMS received (Fig 1)

Informative posters were provided to health centers and displayed at Health Fairs, and clinic staff appeared in radio and TV public awareness campaigns.

As most women seen at GPHC were considered high risk, screening using HbA1C was recommended at the first antenatal care visit to identify previously unknown diabetes. A 75 grams 2hour OGTT was conducted at 24-28 weeks gestational age ideally but up to 36 weeks +6 days if omitted in the earlier period. Obstetric clinic nurses with support from the hospital dietitian provided group and individual education. To facilitate outpatient management women were taught capillary blood glucose testing using Accu-Chek<sup>R</sup> meters loaned for the duration of pregnancy. Sufficient test strips were provided for 10 tests per week according to a pre-determined schedule. Women were advised to have an OGTT 6 weeks postpartum.

Data from the programme was recorded in a specially developed module of the Guyana Health Information System (GHIS). At the time GHIS was the electronic medical record

software that was planned to be used across Guyana to ease the burden of maintaining paper base records and provide continuity of medical records across all public health facilities.

A qualitative study was conducted of women diagnosed with GDM at GPHC from November 2016 to December 2018 to identify barriers to postpartum screening among women who were diagnosed with gestational diabetes. Using a specially developed questionnaire, women were contacted via telephone by the investigator (an Ob/Gyn resident at GPHC) and the answers were transcribed into Microsoft Excel. Women gave verbal consent prior to the interview. All of the women were asked the same questions regardless of whether they completed the postpartum OGTT. Some questions were asked about their general wellbeing and then they were asked specific questions concerning why they had not returned for testing. The questions were grouped into 6 main groups with those being perceived care received at the hospital, postpartum reminders, ease and accessibility to transportation, forgetting/oversight, education – understanding the importance of testing; and fear of the test and what it entails eg- needles, blood and diagnosis of Type 2 diabetes. The study was approved by the Institutional Review Board (IRB) approval number 632/2019. Data was analyzed using SPSS software and frequency tables were used to describe the groups.

Once the programme was established GDM patients were sent a text message every two weeks until 36 weeks and one text message in the postpartum period to encourage adherence with management for a total of 5 messages/woman (supplementary Figure ). An audit was conducted to see if they found the advice helpful.

### **Results**

Between November 2016 and the end of June 2019, 3725 pregnant women were seen at GPHC and 2226 (60%) had a 75gm OGTT between 24-37 weeks gestation, 1779 at GPHC and 447 at an HC (Table 2). Fifteen women were found with Type 2 diabetes before 24 weeks gestation. Four hundred-and-seventy-three (22.1%) had positive 75gm OGT tests, 461(25.9%) at GPHC and 12 (2.6%) at the HC. Fifty-seven women

diagnosed with GDM were referred to GPHC from outside the study area. Those who presented outside of the parameters of the intervention – in labour, after 37 weeks gestational age etc were not screened.

### **Management of women diagnosed with GDM**

Data is reported for 274 women who had delivered to the end of April 2019 and for whom records were available. Women were adherent to self-glucose monitoring and treatment. The majority of patients were managed with medical nutrition therapy (MNT) or MNT plus metformin as outpatients. There was an average of 3 patients a month admitted for insulin treatment, but only 11% of GDM patients needed insulin added to MNT and metformin (see Figure 2). Anecdotally there was minimal to no objection to metformin use by patient and health care providers.

### **Data Management**

The pregnancy module for GHIS was available in beta form from May 2017, but real time entry of patient data was not possible because of lack of desktop computers. Entry into GHIS was retrospective and started in August 2017 but collection was paper-based and often incomplete. By the end of June 2019, 89% of forms had been entered into the database. Weight and height were the data items most commonly missing, despite reminders.

### **Obstetric outcomes**

To May 2019, of 304 women with GDM who had delivered and had data entered, 16 (5.2%) had postpartum haemorrhage, 5 (1.6%) had shoulder dystocia, there were 9 (3%) stillbirths and 140 (46%) were delivered by caesarean section.

### **Patient Satisfaction**

One hundred and thirty-one patient satisfaction surveys were completed during August 2018 to women who had been screened for GDM. Before being screened for GDM 70(53%) had not heard of GDM and how it could affect pregnancy, but 112 (85%) felt adequately informed for the test. Twenty-five (19%) had been screened before. Ninety-seven (77%) found the oral glucose tolerance test easy or tolerable and 113 (86%) said staff explained the results to them. Of 87 women who were taught to monitor their blood glucose 15 (19%) found it difficult or very difficult. Of the 33 women who had received SMS messages, 3 (%) found them useless, the remainder responded that they were useful or very useful.

### **SMS prompts.**

There were 4 months (January, February, November and December) in 2018 and one month in 2019 in which no SMS were sent. Overall, 832 messages were sent to the end of July 2019. From the satisfaction survey 91% who received messages found them very useful. Seventy-five % in the survey did not receive texts, mostly because they were not diagnosed with GDM.

### **Post-Partum Testing**

To the end of June 2019, sixty-four of 411 (15%) women with GDM who had delivered had attended for post-partum testing. During the period of the post-partum study (to December 2018) 379 women were diagnosed with GDM and 196 (51.7%) were contacted to identify barriers to postpartum testing. Among the respondents, 17(8.6%) women returned for a follow-up OGTT within 6-12 weeks after delivery and 179 (91.2%) did not follow-up within 6-12 weeks for a repeat OGTT. Among the women who attended for postpartum (PP) OGTT testing, 3 (17.6%) were diagnosed with Type 2 Diabetes Mellitus (T2DM). The main barrier identified in the patients who did not return for PPOGTT was lack of understanding the importance of the test with 88 (49.1%) of women unable to identify if they were high risk for T2DM. Second, 99 (55.3%) responded that they were not reminded to return for PPOGTT screening, and this further increased to 179 (99.4%) responded as not remembering receiving a text message reminder to return for screening. A small number of women were afraid of having the test (8;4.5%); and of these half (4;2.2%) were afraid of being diagnosed with Type 2 diabetes.

## Discussion

### Main Findings

The programmes for screening and management of hyperglycaemia in pregnancy were successfully introduced. They continue with the majority of patients expressing little difficulty in understanding and managing screening and treatment. The increased awareness of hyperglycaemia in pregnancy from both public and staff education is thought to have contributed to acceptance of the programmes. Staff concerns about increased workload with pressure on staff at GPHC have been manageable to date with no increase in hospital admissions despite increased diagnosis of GDM.

The system of loaning glucose meters for self-testing worked well. While ideally we would have liked sufficient funds to implement more intensive glucose monitoring than 10 tests per week, this proved sufficient for patients who had GDM. More tests would be needed for women with Type 1 and Type 2 diabetes.

The high rate of caesarian section (46% compared to 20.7% over 2014-2018 for GPHC as a whole) may reflect the concerns of obstetricians about the risk of shoulder dystocia and large size or be an effect of early induction (although failure of induction rate is low at 10.4% [14]). This requires further investigation.

Because many patients came from outside the immediate area of GPHC many did not return for postpartum OGTT at GPHC. They may have presented elsewhere and been turned away but data from the small survey conducted suggest that lack of understanding of the need for testing and the risk of developing Type 2 diabetes were significant problems to be addressed in the future. Improvements on returns for postpartum OGTT testing have been seen at the health centers after using some of the strategies from the WINGS project which achieved a 95.8% response in a resource-poor setting [15].

### Strengths and Limitations

One of the strengths of the programme was the commitment of the Guyanese clinical staff and their ability to establish and maintain it with no outside intervention. They are keen to explore the need for implementation outside Georgetown. The engagement of pregnant women and their acceptance of the intervention was also notable. Weaknesses of programme implementation included charts lacking basic information such as weight and height, and forms being filled out in paper form and retrospectively. Despite this 89% of patients screened had some data entered. A further problem was that only 50% of women delivered at GPHC had been screened; however, it is thought by staff that this was mostly because of late transfer (after 37 weeks gestational age) to GPHC.

### Interpretation

The high rate of positive tests for HIP at GPHC is consistent with the system of transferring high risk patients to GPHC. The lower rates at the health centres are also consistent with this. Based on high risk screening using capillary fasting blood sugar, reported rates across the country were much lower in 2016 and 2017 (Region 2 - 3.58% and Region 6 - 2.12%)[13].

Before supporting a nationwide universal screening programme, staff feel that further work is required, for example, a trial of universal screening using a 75gm OGTT at regional hospitals & health centres outside the immediate GPHC catchment area.

### Conclusions

The high rate of GDM at GPHC suggests that this is a high-risk population. The low rate at associated health care centres is consistent with the current system of transferring high risk patients to GPHC. Before supporting a nationwide universal screening programme in preference to a high-risk screening programme, we feel that further work is required, for example a pilot programme of screening for GDM at regional hospitals & health centres outside the immediate Georgetown hospital catchment area. Further investigation of the reasons for the high caesarian section rate and ways of modifying it should be pursued. Our results suggest

universal screening for hyperglycaemia in pregnancy may not be the only choice for women in low-and-middle income countries and may increase rates of caesarian section.

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### **Disclosure of Interests**

None of the authors have any financial interests to declare.

### **Contribution to authorship**

**JL** conceived the project, received the funding, collaborated with local experts to introduce the programme and wrote the drafts of the paper.

**BO** developed the funding submission, managed the project, collaborated with local experts to introduce the programme and revised the drafts of the paper.

**RD,NF,LN, JP, YR and SM** adapted and implemented the programme in Guyana and revised the drafts of the paper.

**SM** designed and carried out the study of barriers to post-partum screening

### **Ethics approval**

Ethics approval for the whole Guyana Diabetes Care Project was provided by the University of Toronto (number 32091). As this was considered programme development no local ethics approval was required. The study of barriers to post-partum screening was approved by the local Institutional Review Board (IRB) approval number 632/2019.

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**WDF** approved the funding as part of the larger Guyana Diabetes Care Programme.

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