

1

Fertility and preconception care in women with disorders of sugar metabolism

Mary Louise Hull¹

1. *University of Adelaide, Adelaide, SA, Australia*

Good diabetic control prior to conception lowers the risk of fetal abnormality and complications of pregnancy, whereas diabetes in men is associated with poorer quality sperm and increased DNA damage. However, there is less certainty about the impact of glucose intolerance or hyperinsulinism on human fertility although both women and men with fertility problems have an increased risk of developing diabetes later in life. Women with polycystic ovarian disease have a particularly high risk, often demonstrating hyperinsulinism and higher rate of euploid miscarriage and gestational and type 2 diabetes. In animal models, exposure of embryos to high glucose environments resulted in delayed blastulation and reduced embryo viability, whereas endometrial effects included lower rates of viable implantation and reduced weight of the fetoplacental unit. The underlying mechanism for these fertility impacts was increased glycosylation of intracellular proteins and enzymes, leading to oxidative stress and DNA damage. Inflammatory cytokines and immune changes were also seen. Disorders of glucose metabolism are thus likely to impact negatively on fertility and miscarriage yet there is little clinical evidence to support this premise. Apart from recommendations to test for diabetes in the pre-published PCOS guidelines, there is poor consensus regarding screening for hyperinsulinism, glucose intolerance or diabetes in couples with infertility. We surveyed fertility specialists and found a significant variety of clinical practice in screening and treating couples for disorders of glucose metabolism. Barriers to effective screening include a lack of consensus on the appropriate test to do and when in treatment to undertake testing. Male testing was particularly controversial. Further research is needed to determine the role of aberrant insulin and glucose metabolism in infertility and miscarriage and how best to approach screening, testing and treatment to improve fertility outcomes.

2

Searching for utopia: defined dietary prescription and medical nutrition therapy for gestational diabetes management

Susan de Jersey

1. *Dietitian, Queensland, Australia*

Dietary therapy is the cornerstone to the management of gestational diabetes mellitus. Medical Nutrition Therapy (MNT) is a therapeutic approach to deliver tailored dietary counselling to manage a disease or condition. The goals of MNT for GDM are to promote optimal foetal growth and maternal health by meeting nutritional needs in pregnancy and to promote normoglycemia, whilst avoiding ketonuria. Controversy remains over the most appropriate dietary prescription for the management of GDM. The aim of this presentation is to give an overview of the evidence in relation to aspects of medical nutrition therapy and defined dietary prescription for GDM including the amount and type of carbohydrate, nutritional adequacy, and gestational weight gain. Achieving a consistent, defined dietary prescription for women with GDM is unlikely to be achieved due to individual characteristics of glucose tolerance and glycaemic response, energy needs to promote healthy weight gain. An individualised approach is likely to achieve optimal pregnancy outcomes, however a renewed research focus on the process to engage women and deliver care is needed to ensure these positive health outcomes are realised.

3

Maternal hyperglycaemia in pregnancies: Effect of maternal management on the newborn and uncertainties surrounding best approaches to neonatal management

Michael Stark^{1,2}

1. *The Robinson Research Institute, School of Medicine, University of Adelaide, Adelaide*

2. *Department of Neonatal Medicine, Women's & Children's Hospital, Adelaide*

Maternal hyperglycaemia in pregnancy represents the most common medical condition complicating both the antenatal and postnatal periods. Despite this there is still much controversy surrounding neonatal complications and postnatal management designed to avoid them. Even with advances in perinatal care, newborns of mothers with hyperglycaemia in pregnancy remain at risk for a multitude of physiologic, metabolic, and congenital complications. While postnatal hypoglycaemia occurs in up to 15 % of normal newborn babies in early postnatal life, the incidence in babies who have risk factors is much greater: up to 50 % in infants of diabetic mothers, large and small babies and 66 % in preterm babies. Care of these infants has focused on ensuring adequate cardiorespiratory adaptation at birth, possible birth injuries, and maintenance of normal glucose metabolism. Critically, neonatal hypoglycaemia is the only neonatal morbidity independently associated with later developmental delay in late preterm babies. While it is uncertain what degree or duration of hypoglycaemia is necessary before morbidity occurs, it is known that even babies without symptoms can have adverse outcomes. Here, the controversies which remain over the implications for the baby of differing approaches to maternal hyperglycaemia management will be discussed. In addition, the significant knowledge gaps in the data supporting current approaches to treatment of neonatal hypoglycaemia, despite repeated calls for the development of evidence-based treatment guidelines, will be highlighted.

Diabetes & Pregnancy: A Personal Perspective Formed Over a 50 Years Career

Boyd Metzger

1. *Northwestern University, Chicago, United States*

Before diabetes mellitus could be treated with insulin, it was rarely seen during pregnancy and was associated with high maternal and fetal mortality. After insulin became available, in 1922, pregnant women with diabetes had better outcomes, but fetal and neonatal deaths remained common. In the mid 20th century, Jorgen Pedersen observed that glucose readily crossed the placenta. This led to the critically important maternal hyperglycemia – fetal hyperinsulinemia – diabetes associated fetopathy (large fetal size, excess body fat and newborn hypoglycemia). Pedersen and others soon demonstrated that with the assistance of a team with medical, obstetric, nutritional and pediatric expertise employing liberal use of hospitalization outcome of pregnancy in women with diabetes could be greatly improved. However, at the time the diabetes and pregnancy center (DPC) was organized at Northwestern University nearly 50 years ago, we found it challenging to convince women with pre-existing diabetes that with meticulous effort and cooperation of patients and the healthcare team, favorable pregnancy outcome was achievable. Many had been advised to avoid pregnancies. Since that time, major technological changes have become available to assist in the achievement of more optimal metabolic control of diabetes in and outside of pregnancy. In 1989, the IDF/WHO Europe St. Vincent declaration set as goal, in all pregnancies complicated by diabetes, perinatal and long-term outcomes similar to women without diabetes. This has been a challenging goal. The number of pregnancies in all types of diabetes in pregnancy, T1DM, T2DM and GDM has increased. The parallel increase in rates of obesity in all ages of the population is an important contributor to this demographic. In 2015, Jovanovic, et al (*Diabetes/Metabolism Research and Reviews*, 31:707-16, 2015) used health claims from a database of 839,792 pregnancies to compare outcomes where diabetes status could be ascertained. Diabetes was present in 7.86%; T1DM 0.13%, T2DM 1.21% and GDM 6.29%. Those defined as GDM during pregnancy but with T2DM postpartum (progressing to T2DM) represented another 0.23%. Significantly higher rates of many pregnancy, neonatal and maternal outcomes were found in 1 or more of the groups listed above. Medical costs were also greater for mothers with compared to those without diabetes, especially for T1DM (nearly doubled). Thus, more than 25 years after the St. Vincent declaration, the goals for pregnancy outcome in mothers with diabetes have not been achieved. Early in the 21st century new advances in insulin delivery and continuous glucose monitoring techniques offer new hope for an effective “artificial pancreas” and true optimal control of hyperglycemia.

Glucocentricity in pregnancy: ignoring other metabolic targets?

Helen Barrett^{1,2}

1. *Endocrinology, Mater Health, Brisbane*

2. *Mater Research, Brisbane*

Women with pregnancies complicated by diabetes mellitus or obesity continue to have poorer pregnancy outcomes for mother and infant. At present our clinical focus is on maternal glucose management, with dietary and pharmacological therapies. Other aspects of maternal metabolism including maternal lipids and ketones offer potential therapeutic targets. I will discuss research relating to the determinants of maternal non-glucose metabolism, and interaction with maternal microbiome.

Women with childhood trauma who develop depression prior to pregnancy are at increased risk of developing gestational diabetes

Danielle AJM Schoenaker^{1,2}, **Gita D Mishra**³, **Leonie K Callaway**^{4,5}

1. *Centre for Behavioural Research in Cancer, Cancer Council Victoria, Melbourne, VIC, Australia*

2. *Discipline of Obstetrics and Gynaecology, Robinson Research Institute, The University of Adelaide, Adelaide, South Australia, Australia*

3. *School of Public Health, Faculty of Medicine, The University of Queensland, Brisbane, QLD, Australia*

4. *UQ Centre for Clinical Research, Faculty of Medicine, The University of Queensland, Brisbane, QLD, Australia*

5. *Obstetric Medicine, Royal Brisbane and Women's Hospital, Brisbane, QLD, Australia*

Aims: Growing evidence suggests that health and behavioural factors during early life and before conception may contribute to risk of developing gestational diabetes mellitus (GDM). Women's childhood psychosocial environment has been shown to influence diabetes risk in non-pregnant populations, but the impact on GDM risk remains unclear. This study sought to examine if the number and type of traumatic experiences in childhood are associated with future GDM risk.

Methods: The study included 6,317 women participating in the Australian Longitudinal Study on Women's Health who were followed from 1996 (age 18-23) until 2015. GDM diagnosis was reported for all pregnancies (N = 11,556). Exposure to eight adverse childhood experiences (ACEs), including abuse and household dysfunction, were recalled. Log-binomial regression models with generalised estimating equations were used to estimate relative risks (RR) and 95% CI. Analysis were adjusted for early life, preconception and antenatal GDM risk factors. Effect modification by preconception mental health was tested using cross-product terms.

Results: Women exposed to a higher number of ACEs were more likely to have lower education, and poorer lifestyle and physical and mental health prior to pregnancy. GDM occurred in 4.7% of pregnancies. Compared with no exposure to ACEs, exposure to any three or more ACEs (6% of women, RR 1.73 [95% CI 1.02, 3.01]) or four or more ACEs (7%, 1.76 [1.04, 2.99]) was associated with elevated GDM risk among women with preconception depressive symptoms, independent of early life, preconception and antenatal risk factors. Out of the eight adverse events examined, physical abuse and household substance

abuse were associated with higher GDM risk. Exposure to ACEs did not influence GDM risk among women without depressive symptoms prior to pregnancy (P-value for interaction=0.01).

Conclusions: Our findings suggest that, in addition to primary prevention of childhood adversity, strategies to curb poor mental health trajectories into adulthood among women who grew up in stressful environments should be considered when developing programs for the prevention of GDM.

7

Health consequences for mother and baby of substantial pre-conception weight loss in women with obesity: Interim analysis of 'time to conception' data

Sarah Price¹, Priya Sumithran¹, Alison Nankervis², Michael Permezel³, Joe Proietto¹

1. *University of Melbourne, Heidelberg Heights, VIC, Australia*

2. *Royal Womens Hospital, Flemington, Victoria, Australia*

3. *Department of Obstetrics, Mercy Hospital for Women, Heidelberg, Victoria, Australia*

Background: Maternal obesity is known to adversely impact both time to conception and pregnancy outcomes. Some data suggests modest weight loss achieved with lifestyle modification reduces time to conception but does not alter pregnancy outcomes. Bariatric surgery alters pregnancy outcomes, but guidelines suggest delaying conception 18-24 months after surgery. We have compared 'time to conception' in obese women after a lifestyle modification (standard care) and after a VLED program.

Methods/design: A two-arm, parallel group, randomized control trial, was conducted at the University of Melbourne. Women (n=164) aged 18-38 years, with a BMI 30-55kg/m², who planned to conceive in the next 6-12 months were randomized to one of two 12-week interventions. Group A aimed for modest weight loss (MWL ≤3% body weight) using a hypocaloric diet. Group B aimed for substantial weight loss (SWL 10-15% body weight) using a modified Very Low Energy Diet (VLED). Participants were observed for 12-months to determine if pregnancy occurred. Time to conception is calculated as the time from the end of the 12-week weight loss intervention to a derived date based on menstrual period and/or ultrasound dates.

Results: Of the 164 women enrolled in the study, n= 124 (76%) completed the weight loss phase of the study and were considered in the current analysis. Mean weight loss achieved was 3.1+/-3.9kg (3.1%) and 12.9+/-5.1kg (12.0%) in Groups A and B respectively. Of completers, n=71 achieved pregnancy (Group A n=30; Group B n=41); the observation period is ongoing in n=38 completers. Time to conception was 136.3 (+/- 94.7) days in Group A and 80.0 (+/-83.37) days in Group B (p=0.043). Miscarriage rate was n=7 (23%) and n=9 (21%) in Groups A and B respectively.

Conclusion: Substantial weight loss prior to conception decreases the time to conception in women with obesity when compared with modest weight loss.

Trial Registration: ANZCTR 12614001160628.

1. Callaway LK, Prins JB, Chang AM et al. The prevalence and impact of overweight and obesity in an Australian obstetric population. *Med J Aust.* 2006;16;184(2):56-9.
2. Ma RCW, Schmidt MI, Tam WH. Clinical management of pregnancy in the obese mother: before conception, during pregnancy, and post partum. *Lancet Diabetes Endocrinol.* 2016 Dec;4(12):1037-1049.

8

Impact of new criteria for the diagnosis of gestational diabetes A maternal and neonatal health outcome and economic analysis in a large tertiary level maternity centre

Thomas J Cade¹, Shaun Brennecke¹, Alexander Polyakov¹

1. *Royal Women's Hospital, Fitzroy, VIC, Australia*

Aim: To compare a cohort diagnosed with gestational diabetes under 1998 ADIPS criteria with 2014 ADIPS criteria, specifically to assess any improvements in outcomes, to attribute costs to the increased incidence and to assess any overall economic benefit.

Methods: Women diagnosed with gestational diabetes in 2014 and in 2016 were included as cases. Control groups in each year were those who did not have GDM (pre-existing diabetes and multiple pregnancy were exclusion criteria). Three analyses were undertaken. Firstly, all women in 2014 were compared to all women in 2016. Secondly, women with GDM were compared to controls in each year. Finally, women with GDM in 2014 were compared to women with GDM in 2016. Analyses included sub-division for diet-controlled and insulin-requiring GDM. Models of care for routine pregnancy, GDM diet-controlled and GDM-insulin controlled were costed using average-occasions-of-service for clinical reviews, pharmacy fees for medications and consumables, and Medicare Benefits Schedule item numbers for ultrasound services.

Results: There was an increase in annual incidence for GDM from 6.0% to 10.4% with costs of care increasing by over \$900 000 (gross) and \$560 000 (nett). There was a small hospital-wide reduction in very large babies (>95%) with no other

significant differences. Women with GDM remain a higher risk cohort than those without GDM, but in 2016 women with GDM (diet-controlled) have similar outcomes to women without GDM.

Conclusions: The new criteria for diagnosing GDM has resulted in a marked increase in annual incidence (73% relative, 4.4% absolute) without a significant improvement in maternal and neonatal outcomes and with a concomitant increase in costs of care. The new criteria may lead to long-term improvements in health that are cost-effective but further research is required to substantiate this. Future randomized controlled trials into different systems of diagnosis and less expensive models of care are also warranted.

9

Implementation in the real world: OGTT failing to detect women at risk of GDM-related adverse birth outcomes

Emma L Jamieson¹, **Erica P Spry**², **Andrew Kirke**¹, **Carly Roxburgh**³, **David Atkinson**⁴, **Julia V Marley**^{2,4}

1. Rural Clinical School of Western Australia, University of Western Australia, Bunbury, WA, Australia

2. Kimberley Aboriginal Medical Services, Broome, WA, Australia

3. Rural Clinical School of Western Australia, University of Western Australia, Albany, WA, Australia

4. Rural Clinical School of Western Australia, University of Western Australia, Broome, WA, Australia

Aims: Follow 600 pregnant women in regional and remote Western Australia to delivery, to assess effectiveness of the OGTT in detecting adverse GDM-related perinatal outcomes.

Methods: Forty-one primary healthcare clinics across the Kimberley, Mid-West, Goldfields, Southwest and Great Southern regions participated between 1st January 2015 to 1st February 2018. Women, aged 16-years or over, at first antenatal presentation, were invited to participate. Women with confirmed diagnosis of diabetes mellitus or multiple pregnancy were excluded. Routine maternal and birth data were collected and GROW Customized Birth Weight Centiles calculated. OGTT [mmol/L] results were categorised based on the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study (fasting: 2.5-4.1, 4.2-4.4, 4.5-4.7, 4.8-4.9, 5.0-5.2, 5.3-5.5, 5.6-5.8; 1-hour: 2.5-5.8, 5.9-7.3, 7.4-8.6, 8.7-9.5, 9.6-10.7, 10.8-11.7, ≥11.8; 2-hour: 2.5-5.0, 5.1-6.0, 6.1-6.9, 7.0-7.7, 7.8-8.7, 8.8-9.8, 9.9-11.1). GDM diagnosis was based on IADPSG criteria. Two study General Practitioner Obstetricians, blinded to routine investigations, independently determined if adverse perinatal outcomes were likely GDM-related.

Results: Of 694 recruited participants, 604 (66% with one or more high-risk factor) continued participation (39% Aboriginal) and delivered after 24 weeks gestation. Only 61% adhered to 2014 ADIPS screening recommendations. Sixty-seven (11%) met the criteria for GDM. Women screened at 24-32 weeks were significantly more likely to be in a lower glucose category compared with the HAPO cohort (fasting: OR 3.4; 95% CI 2.8-4.0, $p < 0.0005$; 1-hour: OR 1.7, 95% CI 1.4-2.0, $p < 0.0005$; 2-hour: OR 1.4, 95% CI 1.2-1.7, $p < 0.0005$). Glucose instability in our cohort was a likely consequence of delays in laboratory testing (median time-to-analysis: 4.4 hours vs HAPO <1 hour). Preliminary analysis suggest 79% of mothers of infants with composite outcome of birth weight >90th centile and/or neonatal hypoglycaemia, had a normal OGTT or were not tested.

Conclusions: In this high-risk for GDM population, the OGTT was poorly accepted and not implemented according to strict pre-analytical guidelines. Consequently, this one-step screening and diagnostic tool fails to identify women who would likely benefit from intervention.

10

Is diagnosis and treatment of gestational diabetes earlier than 20 weeks associated with adverse outcomes?

Maryam Sina¹, **Jeff Flack**^{1,2}, **David Simmons**¹, **Vincent Wong**^{3,4}

1. School of Medicine, Western Sydney University, NSW

2. Diabetes Centre, Bankstown-Lidcombe Hospital, Bankstown, NSW

3. Ingham Institute of Applied Medical Science NSW, University of New South Wales, NSW

4. Diabetes and Endocrine Service, Liverpool Hospital, Liverpool, NSW

Aims:

Recent ADIPS guidelines note that high-risk pregnant women are more likely to have gestational diabetes mellitus (GDM) and therefore, are recommended to be screened earlier (<20 weeks). Women diagnosed with early GDM are at increased risk of adverse outcomes (Immanuel & Simmons, 2017) and are treated once diagnosed including glucose and weight management. This study compared the clinical characteristics, and pregnancy outcomes of women with GDM diagnosed at <20 weeks gestation and those at ≥20 weeks gestation, in a large treated multiethnic cohort.

Methods:

Data were from a retrospective combined clinical review of GDM women diagnosed by ADIPS 1998 criteria and managed at Liverpool and Bankstown-Lidcombe hospitals from 2010-2016. Women with fasting plasma glucose ≥7.0 mmol/L and/or 2hr plasma glucose ≥11.1 mmol/L, during pregnancy, were excluded. Characteristics were compared using Chi-squared and ANOVA. Odds Ratios (ORs) and 95% confidence intervals (95%CI) were assessed using multivariable logistic regression.

Results:

Women diagnosed earlier (n=1,216) were more likely to have high-risk characteristics: (older, higher body mass index, greater proportion with previous GDM and family history of diabetes, and higher HbA1c at diagnosis) than those diagnosed later during pregnancy (n=2,649), ($P < 0.05$). However, fasting and 2hr glucose concentrations were similar. Women with early GDM were most likely to require insulin during pregnancy (OR 1.90; 95%CI: 1.58, 2.29). Women diagnosed earlier also had a higher risk of congenital malformations (OR 1.45; 95%CI: 1.01, 2.08); preterm delivery (OR 1.61; 95%CI: 1.26, 2.08) and neonatal

hypoglycaemia (OR 1.60; 95%CI: 1.34, 1.91). The risk of caesarean section was lower in those diagnosed early (OR 0.50; 95%CI: 0.43, 0.58). The risk of small- and large- for gestational age was not statistically different between the two study groups ($P>0.05$).

Conclusion:

Poorer pregnancy outcomes were found among women with early diagnosis of GDM in spite of standard glycaemic management. Additional interventions beyond existing management may be required for women with early GDM.

Managing Gestational Diabetes Mellitus with the M♡THER App and Interactive Internet based Clinician Portal (Internet-Based)

Roisine Warwick¹, Wendy Dutton², Marlene Varnfield³, Naomi Scolari⁴, Higgins Liesel⁵

1. *Bayside Chronic Disease, Metro South Health, Redlands, QLD, Australia*

2. *Redland Hospital, Cleveland, QLD, Australia*

3. *CSIRO, Brisbane, QLD, Australia*

4. *Bayside Chronic Disease, Metro South Health, Redlands, QLD, Australia*

5. *Transformation and Innovation Collaborative, Metro South Health, Brisbane, QLD, Australia*

Background

Implementation of the Australian Diabetes in Pregnancy (ADIP-2014) guidelines increased the number of women diagnosed with Gestational Diabetes Mellitus (GDM) at Redland Hospital.

Women use paper diaries to record blood glucose levels (BGL's) that is inconvenient, time consuming and ineffective, rendering sharing of health care for these women suboptimal and resource intensive. To improve care, a digital platform called M♡THER, consisting of a smartphone app to support women with GDM and an Internet-based interactive system for their treating clinicians was developed by CSIRO in collaboration with Redland Hospital. The project was funded by Metro South Health (MSH), Information and Communication Technology (ICT) and the Executive Planning and Innovation Committee (EPIC).

Aim

A pilot study was conducted to investigate the effectiveness, convenience and user-friendliness of the M♡THER platform.

Methods Pilot study

40 women diagnosed with GDM between 24-28 weeks gestation (nil previous GDM) were recruited. The smartphone App uploaded the readings to the portal when the women manually or by Bluetooth entered their BGL's to their meter. Clinicians reviewed the BGL's results at any time via the portal. Incorporated into the App are: personal goals, exercise, diet and educational multimedia content links. Post-delivery a user experience survey was sent to all participants (women and staff involved in their care).

Results

40 women participated, 8 women were identified with elevated readings in the first week of using the app enabling early intervention. Due to elevated fasting BGL's, 12 were commenced on Metformin, 8 were commenced on insulin.

A survey response from the women showed the app is user friendly, convenient, and continuation is highly recommended. Treating clinicians reported improved communication with the women they treat and showed an increase in multi-disciplinary co-ordination amongst themselves.

Conclusion

The pilot study has confirmed that this technology works for women with GDM. Use of the M♡THER platform improved Holistic care, accurate reporting of BGLs, client satisfaction and increased communication between multi-disciplinary team staff.

1. Australian Diabetes in Pregnancy Guidelines:
https://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf

Exercise improves glycaemic control in women diagnosed with gestational diabetes mellitus: a systematic review

Anne L Harrison^{2,1}, **Nora Shields**^{2,3}, **Nicholas F Taylor**^{2,4}, **Helena C Frawley**^{5,6}

1. *Physiotherapy, Mercy Hospitals Victoria Ltd, Melbourne, Victoria, Australia*

2. *La Trobe University, Melbourne, Victoria, Australia*

3. *Northern Health, Melbourne, Victoria, Australia*

4. *Allied Health Clinical Research Office, Eastern Health, Box Hill, Victoria, Australia*

5. *Centre for Allied Health Research and Education, Cabrini Health, Melbourne, Victoria, Australia*

6. *Department Physiotherapy, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Victoria, Australia*

Aim: To investigate if exercise improves postprandial glycaemic control in women diagnosed with gestational diabetes mellitus.

Design: A systematic review with meta-analysis of randomised, controlled trials.

Method: Participants were pregnant women diagnosed with gestational diabetes mellitus where the intervention was exercise, performed more than once a week, sufficient to achieve an aerobic effect or changes in muscle metabolism. Outcome measures included postprandial blood glucose, fasting blood glucose, glycated haemoglobin, requirement for insulin, adverse events and adherence.

Results: Eight randomised, controlled trials (588 participants) were included; seven of these trials (544 participants) had data that were suitable for meta-analysis. Five trials scored ≥ 6 on the PEDro scale, indicating a relatively low risk of bias. Meta-analysis showed that exercise, as an adjunct to usual care, significantly improved postprandial glycaemic control (MD -0.33 mmol/L, 95% CI -0.49 to -0.17) and lowered fasting blood glucose (MD -0.31 mmol/L, 95% CI -0.56 to -0.05) when compared with standard care alone, with no increase in adverse events. Effects of similar magnitude were found for aerobic and resistance exercise programs, if performed at a moderate intensity or greater, for 20 to 30 minutes, three to four times per week. All studies reported that complications or other adverse events were either similar or reduced with exercise.

Conclusion: Adding exercise to usual care of gestational diabetes mellitus, safely helps to control postprandial blood glucose levels and other measures of glycaemic control and may assist in reducing maternal and neonatal complications in gestational diabetes mellitus.

Individualised multidisciplinary management of gestational diabetes with protocolised frequent follow-up results in fewer neonatal special care nursery admission in private practice.

Wendy Bryant¹, **Chelsea McMahon**¹, **Monika Fazekas-Lavu**¹, **Katherine Tonks**¹

1. *Department of Endocrinology, Mater Hospital, North Sydney, NSW, Australia*

Background: Gestational diabetes (GDM) affects approximately 10% of the Australian population. Management of GDM through public hospitals alone is not practical due to limited resources. There is a paucity of data of private models of GDM care.

Aims: This is the first report of results of an evidence-based program in a private GDM clinic in Australia.

Methods: Retrospective review of de-identified data for all women with GDM, and their babies, admitted for confinement to a Sydney private hospital from Feb 2015 to Aug 2016. We compared women who underwent treatment with Sydney Endocrinology (SE) to those whose GDM was managed privately or publically elsewhere. The SE multidisciplinary GDM clinic was founded with funding from a Friends of the Mater grant.

Results: Of 3800 births 390 babies were born to mothers with a history of GDM. Of these, 177 were managed through SE. The SE protocol includes an initial one-on-one multidisciplinary review with an endocrinologist, dietitian and diabetes educator, then weekly email contact, and further visits as required. Where possible, there is direct liaison with the patients obstetrician and midwife.

SE patients did not differ from non-SE patients in age (34.9 vs 34.6 years), BMI (24.0 vs 24.1 kg/m²), or ethnicity (all p=NS). There was no increase in the odds of elective or emergency Caesarian section (p=0.49, chi squared test for trend, Newcombe-Wilson method). SE patients had in increased odds of insulin and/or metformin prescription (49% vs 35%, respectively, OR 1.8, 95% CI 1.2-2.7, p=0.005).

The SE babies did not differ from non-SE babies in gestational age at birth (mean 38.3 vs 38.2 weeks, respectively), weight (3177 +/- 519g vs 3238 +/- 477g, respectively), length (mean 50.6 vs 50.8 cm, respectively) or head circumference (all p=NS). There was a lower rate of special care nursery (SCN) admission for SE vs non-SE patients (23% vs 32%, respectively, OR 0.62, 95% CI 0.40-0.97, p=0.04). Similarly there were lower rates of hypoglycaemia (defined as ≤ 2.5 mmol/L, 36% vs 48%, respectively, OR 0.61, 95% CI 0.41-0.92, p=0.02). There was no difference in the mean lowest glucose of those that suffered hypoglycaemia in each group (2.0 vs 2.0 mmol/L, p=NS), rates of jaundice (32% vs 29%, p=0.7), nor foetal anomaly (7.3% vs 7.0%, p=0.8).

Discussion: In the private health care setting, GDM patients managed through a individualised multidisciplinary system with protocolised frequent follow-up are less likely to require SCN admission. This is likely related to more frequent initiation of insulin therapy, and is not associated with increased rates of neonatal hypoglycaemia, jaundice or malformation. We also postulate this is related to close frequent follow-up of patients, and extensive dietetic coaching and input. Further studies in this area would be useful to confirm these findings.

Predictors of Pharmacotherapy Choice in Women with Gestational Diabetes

Natassia Rodrigo^{1,2}, **Kathleen Pak**³, **Rachel T McGrath**^{1,2}, **Gregory R Fulcher**^{1,2}, **Sarah J Glastras**^{1,2}

1. Endocrinology, Royal North Shore Hospital, St Leonards, NSW, Australia

2. University of Sydney, Sydney, NSW, Australia

3. Monash University, Melbourne, NSW, Australia

Background/aims:

Metformin is a potential alternative to insulin therapy for Gestational Diabetes Mellitus (GDM), however controversy still exists regarding its optimal use and relative therapeutic benefit. The aim of this study was to determine maternal characteristics associated with pharmacotherapy choice and relationships with maternal and fetal outcomes.

Methods:

This retrospective, cohort study included women with GDM attending Royal North Shore Hospital from 2010 to 2017. Maternal characteristics, pharmacotherapy, and maternal and fetal outcomes were extracted from electronic medical records. Univariate and multivariate analyses were undertaken using SPSS v24.

Results:

Of 540 women with GDM (age 33.8 ± 4.5 years, BMI 25.3 ± 5.8 kg/m², parity 1.7 ± 0.8 , gestational age at GDM diagnosis 25.5 ± 5.8 weeks), 269 (49.8%) were managed with diet and lifestyle modification alone, 166 (30.7%) with insulin, 64 (11.9 %) with metformin and 41 (7.6%) with combination metformin and insulin.

Women managed with diet/lifestyle had lower BMI compared to other groups ($p < 0.005$). Higher BMI was predictive of metformin use in the diet group ($p < 0.05$), and supplemental therapy in the metformin group ($p < 0.05$). Earlier diagnosis of GDM was predictive of metformin therapy ($p < 0.005$). Women diagnosed later in pregnancy were less likely to require pharmacotherapy ($p < 0.05$). Higher fasting blood glucose at diagnosis was indicative of need for pharmacotherapy ($p < 0.05$). Women requiring combination metformin and insulin were older ($p < 0.01$), with higher BMI, and greater parity (both $p < 0.05$). There was no difference in adverse maternal or fetal outcomes between groups.

Conclusion:

Our data indicate that early-pregnancy BMI, gestational age at GDM diagnosis, and fasting blood glucose level on OGTT are significant predictors of the requirement for pharmacotherapy. Maternal and fetal outcomes were similar regardless of therapeutic choice, suggesting that treating to target glucose levels confers maternal and fetal benefit irrespective of the agent chosen.

HAPO AND HAPO FUS: Implications for the Diagnosis of Gestational Diabetes

Boyd Metzger

1. Northwestern University, Chicago, United States

Before the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study was carried out, it was controversial whether maternal hyperglycemia less severe than that in diabetes mellitus is independently associated with increased risks of adverse pregnancy outcome. The HAPO Study found continuous associations of maternal glucose levels less than those diagnostic of diabetes with 4 primary outcomes (birth weight >90th percentile, primary Cesarean delivery, cord-blood serum C-peptide >90th percentile, clinically identified neonatal hypoglycemia). Associations with several secondary endpoints that included neonatal adiposity, preterm delivery, shoulder dystocia or birth injury and preeclampsia were also found. There were no obvious thresholds at which risks increased. These and other study results lead the International Association of Diabetes and Pregnancy Study Groups (IADPSG) to propose "outcome-based" criteria for the diagnosis of gestational diabetes mellitus (GDM). Questions about the application of these criteria in routine clinical care will be discussed elsewhere in this conference.

This presentation will focus on the HAPO Follow Up Study (HAPO FUS) that included examinations of mother-child pairs 10-14 years after participation in the original HAPO Study. The primary goal of the child component of HAPO FUS was to examine associations of maternal glycemia and GDM with childhood adiposity in a cohort treatment where treatment of maternal hyperglycemia was not a confounding factor. A second goal was to examine associations of maternal glycemia and GDM with childhood disorders of glucose metabolism (impaired glucose tolerance [IGT], & T2DM). HAPO FUS found highly significant associations of GDM with multiple measures of child adiposity at 10-14 years of age, i.e., BMI thresholds for obesity, % body fat, sum of skinfolds and waist circumference. However, the association of GDM with the BMI threshold for overweight/obesity combined was of borderline significance, confirming the common observation that not all children with a high BMI are obese. HAPO FUS also found highly significant associations of GDM with IGT/T2DM, but not with impaired fasting glucose. Offspring of HAPO FUS mothers retrospectively classified as GDM by IADPSG criteria were also more insulin resistant with a lower Disposition Index than those whose mothers did not have GDM.

In conclusion, the HAPO & HAPO FUS studies indicate that GDM by IADPSG criteria is associated with adverse perinatal and long-term outcomes that can contribute to the cycle of increasing obesity and metabolic disorders globally.

16

Introduction – Current Australian criteria / NZ criteria. Time for review?

David McIntyre

1. *Head of Mater Clinical Unit, University of Queensland, South Brisbane, Australia*

Since their initial publication in 2010, the IADPSG recommendations for detection and classification of hyperglycemia in pregnancy have drawn divergent responses from women, clinicians and policy makers around the world. Despite endorsement from WHO (2013) and FIGO (2015), international consensus remains elusive and concerns about “overdiagnosis” persist. ADIPS was involved in the international consensus process leading to these recommendations from the earliest stages and strongly participated in the national consensus process, led by RANZCOG, which led to predominant adoption of the “one step” IADPSG process across Australia. This approach has been endorsed in current (2018) NHMRC guidelines for antenatal care.

Nonetheless, concerns regarding the high prevalence of GDM, especially in areas with a large proportion of women in the childbearing years from high risk ethnic groups, have so far prevented uniform adoption of IADPSG / WHO2013 diagnostic criteria for GDM across Australia. Concerns include the potentially unmanageable workload posed by increasing numbers of GDM patients, doubts about “value” or risk / benefit and cost / benefit aspects of treatment and concerns from women that a GDM diagnosis may preclude them from continuing in their preferred model of care.

Further, some important stakeholder organizations including the RACGP have declined to endorse the current guidelines. Proposals have been floated for a new consensus development process involving a broader spectrum of consumer and professional interest groups. This symposium aims to present a range of views on the current status of GDM diagnosis, drawing on local and international experience from the endocrine, obstetric, midwifery and diabetes education perspectives.

17

Some International perspectives regarding changing the criteria for GDM

David Simmons¹

1. *Western Sydney University, Campbelltown, NSW, Australia*

The IADPSG/WHO criteria were intended to move a plethora of diagnostic approaches to gestational diabetes (GDM) to a common pregnancy outcome based set of diagnostic criteria. However, the adoption of these epidemiologically based criteria increases workload (costs) for the diabetes/antenatal services, with a reduction in birth and possibly longer term complications. While many countries have moved to the new criteria (including Australia), others have either remained unchanged (eg New Zealand), moved to other criteria based upon the Hyperglycaemia And Pregnancy Outcomes (HAPO) risk thresholds (eg Canada, India) or manufactured other criteria (eg the UK). There have now been several studies describing how the shift (with no other service changes) from old to the new criteria (Spain, Taiwan) were associated with a reduction in adverse pregnancy outcomes. Other studies have shown that those untreated yet fulfilling IADPSG/WHO criteria have poor outcomes with both untreated fasting (eg UK odds ratio (95%CI) 5.1-5.5 mmol/l vs background: LGA-4.47(3.15-6.33), emergency caesarean section 1.66 (1.13-2.43), polyhydramnios (4.67 (1.83-11.89)) and untreated 1 hour (eg UK odds ratio (95%CI) ≥ 10.0 mmol/l vs background: LGA-2.58 (1.93-3.46), emergency caesarean section 1.49 (1.10-2.21), polyhydramnios (7.46 (4.06-13.72)) post glucose load results. In Canada, where the criteria are at a higher HAPO threshold (odds ratio 2.0), the risk of adverse neonatal outcomes in those with untreated GDM by IADPSG/WHO criteria are 1.4(1.1-1.9) fold that of the background population. Sweden has elected to address the uncertainty behind the costs and benefits of introducing the new IADPSG/WHO criteria, by rolling them out through a nationwide step wedge cluster randomised controlled trial (the CDC4G trial). The new criteria clearly target a group of women at substantially increased risk of adverse pregnancy outcomes. International experience can inform the Australian/New Zealand debate on which criteria will yield the best balance of costs and benefits.

18

Midwife / Diabetes Educator perspective. View from the trenches... How are we managing workload issues?

Janet Lagstrom¹

1. *Diabetes Nurse Practitioner, Yarrowonga, VIC, Australia*

The Australian Diabetes Pregnancy Society (ADIPS), first updated the Gestational Diabetes (GDM) guidelines in 1999, over time, implemented around Australia. Ready for change, ADIPS adopted the consensus guidelines by the International Association of Diabetes and Pregnancy Study Groups (IADPSG, 2010), in 2014. These developed from the growing evidence base for adverse outcomes in pregnancy enhanced by the Hyperglycemia and Adverse Pregnancy Outcome Study (HAPO, 2008).

Four years later, Australia and New Zealand continue to lack uniformity in management of GDM women, stemming from the Royal College of General Practice (2016- 2018) statement “at present, little evidence that clinical intervention is beneficial for the additional women identified by the new screening criteria”, as such has been (mis)interpreted around rural and tertiary Institutions.

Change included:

ADIPS ASM 2018 – ORAL AND POSTER ABSTRACTS

- Omission of 1-hour 50g Glucose Challenge Test (GCT): one step diagnosis (less anxiety, however longer test for pregnant women).
- Lowered FBG diagnostic target (from less than 5.5 to 5.0 mmol/L) (increased women diagnosed and, workload for staff)
- Additional diagnostic target, 1 hour post 75g load *to reduce Caesarean births* (should we advise checking 1 hour or 2 hour pp for these women)
- Provision of 2 options whether to commence medication, suggesting Clinicians make own decision rather than use a National Consensus, lending women to receive conflicting advice from GP, CDE, and Birth Venue

(Will women change Birth Venue to avoid insulin initiation)

On behalf of the women we care, I seek consensus:

- We should develop and use clear terminology
- We should liaise with our respective Clinical partners (RACGP / RANZCOG/ AAPP)
- We should develop and use consistent criteria, regardless of site
- We should be aware of current guidelines

Please share your opinion!

1. ADIPS (2014), ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia. [Online]. Retrieved from: <https://adips.org/information-for-health-care-providers-approved.asp>
2. HAPO Collaborative Research Group (2008), Hyperglycemia and adverse pregnancy outcomes. *The New England Journal of Medicine*, 358: pp. 1991-2002.
3. IADPSG Consensus Panel (2010), International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy, *Diabetes Care*, 33: pp. 676-682.
4. RACGP (2016). RACGP Clinical Guidelines. General practice management of type 2 diabetes. [Online]. Retrieved from: <https://www.racgp.org.au/your-practice/guidelines/diabetes/13-diabetes-and-reproductive-health/133-gestational-diabetes-mellitus>

Obstetrician perspective.

Ian Fulcher¹

1. *Liverpool Hospital and Bathurst Base Hospital, Liverpool, NSW, Australia*

The juxtaposition of the new IADPSG diagnostic criteria, increasing maternal obesity, advancing age at conception and background ethnic predisposition to diabetes has led to a significant increase in women being diagnosed with gestational diabetes.

The HAPO Study published in 2008 has provided us with the largest database on fetal outcomes in pregnancies complicated by hyperglycaemia of varying degrees of severity. On the basis of this the IADPSG recommended the formulation of new consensus guidelines for the diagnosis of GDM.

These recommendations were endorsed by WHO and ADIPS as well as ADS but not by SOMANZ or ESA. In November 2013 RANZCOG convened a multidisciplinary working party to discuss the proposed pathway and criteria for diagnosis of GDM. Although invited, representation from ESA and RACGP was declined. This meeting recommended:

1. A single step OGTT at 24-28 weeks' gestation
2. Adoption of WHO-2013 diagnostic criteria by 1 Jan 2015.

The increased workload has led some Obstetricians to question the validity of the GTT cut-offs determined by a RR of 1.75 based on the HAPO data. The concerns expressed include:

1. Crowded clinics may result in higher risk patients being overwhelmed by lower risk patients.
2. Doctor fatigue may result in warning signs of adverse outcome being missed.
3. Being labelled "lower risk" may alter perception of risk and alter compliance accordingly.
4. Input and advice in the step-down clinic may vary from the high -risk clinic.

Discussion points:

1. Have the new guidelines led to significant improvement in fetal outcomes?
2. Should we maintain Australian guidelines rather than adhere to international guidelines to improve our flexibility to respond to local issues?
3. Should we define a high-risk algorithm including obesity and advancing maternal age and ethnicity to select those at greater risk to optimise provision of appropriate levels of care?

20

Diabetic nephropathy and pregnancy

Shilpa Jesudason

Diabetes is the leading cause of kidney disease and kidney failure in Australia. We are increasingly observing diabetic kidney disease in patients of a younger age.

Kidney disease of all stages can have an impact on pregnancy outcome. In this session the significance of any disease in pregnancy will be discussed, with a focus on diabetic nephropathy and the particular challenges this poses. There will be a discussion of the impact of early stage kidney disease on pregnancy, and tips for management to optimise outcomes.

21

Cardiomyopathy and pregnancy

Joanne Judd¹

1. *Cardiologist, Adelaide, Adelaide, SA, Australia*

Heart disease is the most common cause of morbidity and mortality in women in pregnancy. There is a risk of cardiomyopathies in pregnant women, and this is further increased in diabetic women.

This talk will discuss some of the common causes of maternal death in Australia. It will include a brief discussion of the circulatory changes in pregnancy and birthing, and which cardiac conditions are considered high risk in pregnancy. The use of medications to treat heart failure in pregnancy will be reviewed. Three different types of cardiomyopathy in pregnancy will be discussed including Peri-partum, Dilated and Hypertrophic Cardiomyopathy and will be illustrated by clinical cases.

22

Retinopathy and pregnancy

Jamie Craig¹

1. *Flinders University, Adelaide, SA, Australia*

Content not provided in time of print

23

Should we recommend insulin pumps and CGM in pregnancy?

Sue Mei Lau¹

1. *Prince of Wales Hospital, Randwick, NSW, Australia*

Insulin pumps and CGMS are being increasingly used to manage type 1 diabetes in pregnancy, but are they worth the time and resources? This presentation will look at the evidence for insulin pumps and CGMS in pregnancy and discuss factors influencing the decision to use these forms of technology in pregnancy. Examples will be presented of patients who may (or may not) have benefited from pumps in pregnancy.

24

Practical tips on managing women on insulin pumps and CGM

Winnifred Lee¹

1. *Mater Hospital, Spring Hill, QLD, Australia*

The benefits of Insulin pump use in pregnancy have been difficult to define in clinical trials and are not “a script to be dispensed for all”. This is due to several issues including 1) HbA1c changes are not adequate to assess benefits 2) insulin pumps are used often later in the disease, with complications or when there is loss of hypoglycaemia awareness 3) benefits of the insulin pump are operator- dependent and require anticipatory adjustments 4) appropriate comprehensive management requires a team of experienced diabetes educator, dietitian and endocrinologist to support the patient with the significant changes in insulin requirements in pregnancy. This presentation will show how “time in range” glucose monitoring and knowledge of anticipatory insulin pump adjustments may improve pregnancy outcomes. Cases will be presented highlighting how insulin pump therapy may be helpful in managing diabetes in pregnancy, including a guide to insulin pump rate adjustments through pregnancy, management of those with severe insulin resistance and peripartum management involving steroids.

Nuts and bolts of pumps and CGM**Rebecca Humphreys**

1. *Australian Diabetes Educators Association, ACT, Australia*

With the use of insulin pump therapy and continuous glucose monitoring on the rise, this session will cover the practical aspects of these devices in pregnancy, including planning for delivery, infusion set placement and what to look at in the data reports. Rebecca will also explain the current devices that are available in Australia and what the cost is to patients. This session will also include some case examples and experiences from her practice with using CGM in pregnancy.

Heterogeneity in insulin sensitivity and insulin secretion in gestational diabetes mellitus relates to differences in pregnancy outcomes**Lene Madsen¹, Kristen Gibbons², David McIntyre³**

1. *Endocrinology, Aarhus University, Aarhus, Denmark*

2. *Mater Research, University of Queensland, South Brisbane, Queensland, Australia*

3. *Mater Research and School of Medicine, University of Queensland, South Brisbane, QLD, Australia*

Varying clinical phenotypes exist within the overarching “diagnosis” of Gestational Diabetes Mellitus (GDM), encompassing women with predominant defects in insulin sensitivity, insulin secretion or a combination of both. We aimed to determine if GDM phenotypes were independently associated with birthweight, LGA (large for gestational age), preterm delivery, caesarean delivery (CS), and a composite of GDM-related adverse pregnancy outcomes (LGA, neonatal hypoglycemia, or caesarean delivery), when adjusted for potential confounders.

Using data from OGTTs at mean gestational week 28 in the Brisbane HAPO study cohort, we estimated insulin sensitivity (Matsuda index) and secretion (HOMA β) in 1245 women. In women with GDM (10.5%, when using IADPSG criteria), defects in insulin sensitivity and/or insulin secretion were defined as <25th percentile in non-GDM women. This approach yielded four subgroups named by the predominant defect; low insulin sensitivity (GDMsens), low insulin secretion (GDMsec), both defects (GDMmixed), or no detectable defects (ND). We created linear and logistic regression models adjusted for maternal age, maternal height, BMI, smoking, gravidity, parity, family history of diabetes, mean arterial BP, and HbA_{1c}. No women received GDM treatment during pregnancy.

Relative to non-GDM women, women in the GDMsens group (52.7% of all GDM) had higher BMI (33.8 vs 28.6 kg/m², p<0.001), higher mean arterial BP (87 [SD 7] vs 83 [SD 7] mmHg, p<0.001), gave birth to heavier infants (birth weight z scores 0.67 [SD 1.12] vs 0.19 [SD 0.98], p<0.001) with a higher odds of LGA (OR 2.34; 95% CI 1.33, 4.12; p=0.003); had higher odds of preterm delivery (OR 2.62; 95% CI 1.14, 6.04; p=0.024), and higher odds of delivering by CS (OR 1.89; 95% CI 1.15;3.10, p=0.012). Relative to non-GDM women, women with GDMsec defects (17.6%) were older (33.6 [SD 4.5] vs 29.2 [SD 5.2] years, p<0.001), but pregnancy outcomes were similar. Relative to non-GDM women, women in the GDMmixed (14.5%) group had higher BMI (32.8 [SD 6.5] vs 28.6 [SD 5.5] kg/m², p=0.003) and showed similar trends in outcomes to the GDMsens group, though none achieved significance. The ND women (15.3%) did not differ from non-GDM women. When adjusting for confounders including BMI, only the GDMsens group were still at increased odds for preterm delivery (OR 2.56; 95% CI 1.02, 6.46; p=0.046). After adjusting for BMI, the odds of CS and LGA babies were no longer higher in the GDMsens group. We found no increased risk of the composite GDM-related adverse pregnancy outcome in any subgroup.

Different clinical phenotypes in GDM are associated with differing risks of LGA infants, preterm delivery, and caesarean delivery. Women with GDM, predominantly due to a defect in insulin sensitivity have higher risks of adverse outcomes; only partly explained by BMI and other confounders.

Comparison of the Oral Glucose Tolerance Test and HbA1C as a diagnostic screening tool for Gestational Diabetes**Neoma Withanawasam¹, Sanyogita Tara¹, Geoffrey McCallum¹**

1. *Obstetrics and Gynaecology, Eastern Health, Melbourne, Victoria, Australia*

Introduction

Gestational diabetes (GDM) has a strong association with adverse pregnancy outcomes therefore screening is recommended in all pregnant women.

Although it is regarded as the diagnostic tool of choice, the OGTT has a number of drawbacks and therefore the ADIPS consensus guidelines has suggested the HbA_{1c} as an alternative screening tool for GDM.

The aim of this prospective study is to evaluate the performance of HbA_{1c} to detect GDM in comparison to the OGTT and to assess the association between HbA_{1c} and the risk of adverse pregnancy outcomes.

Method

100 women that attended one of three outpatient antenatal clinics were recruited. The blood samples for the OGTT and the HbA_{1c} were collected concomitantly.

The WHO criteria was used to then compare various levels of HbA_{1c} against, to thus determine sensitivity.

Results

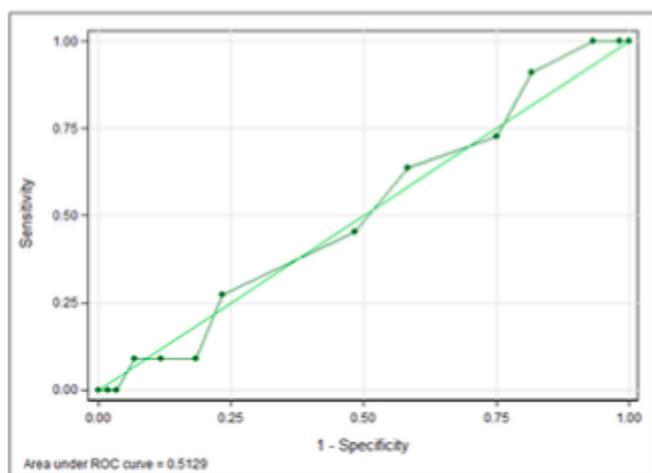


Figure 2: Receiver operative curve for the GDM diagnostic accuracy of HbA1c [Sensitivity = the probability of a test to correctly identify those with the disease, Specificity = the probability of a test to correctly identify those without the disease]

The HbA1c did not perform well in distinguishing GDM cases from no-GDM based on the OGTT (AUC 0.513, 95% CI 0.333 – 0.693).

In regards to the association between HbA1c and adverse fetal outcomes, our study estimate suggests that a unit increase in HbA1c was associated with a 1.79 time increase in odds of resuscitation and higher HbA1c results were associated with smaller birth weight.

Discussion

Further research is required, especially correlating lower levels of HbA1c to GDM. The HbA1c in its current form should not be used to screen GDM as it can falsely reassure clinicians due to low sensitivity.

The influence of maternal age, booking body mass index, and ethnicity on the prevalence of booking gestational diabetes mellitus. Preliminary findings from a multicenter randomized controlled trial

Jincy Immanuel¹, David Simmons¹, Lisa Vizza¹, Bill Hague², Helena Teede³, N Wah Cheung⁴, Emily Hibbert⁵, Christopher Nolan⁶, Michael Peek⁷, Vincent Wong⁸, Jeff Black⁹, Mark Mclean¹⁰, Alexandra Kautzky-Willer¹¹, on behalf of the¹²

1. School of Medicine, Western Sydney University, Campbelltown, NSW, Australia

2. Robinson Research Institute, The University of Adelaide and Women's and Children's Hospital, Adelaide, South Australia, Australia

3. Monash University, Melbourne, Victoria, Australia

4. Westmead Hospital, Sydney, NSW, Australia

5. Nepean Hospital, Sydney, NSW, Australia

6. Canberra Hospital and Australian National University, Canberra, ACT, Australia

7. Australian National University, Canberra, ACT, Australia

8. Liverpool Hospital, Sydney, NSW, Australia

9. Bankstown-Lidcombe Hospital, Sydney, NSW, Australia

10. Blacktown Hospital, Sydney, NSW, Australia

11. Gender Medicine Unit, Division of Endocrinology and Metabolism, Department of Medicine III, Medical University of Vienna, Vienna, Austria

12. TOBOGM, consortium

Aim: This study assessed the prevalence of Gestational Diabetes Mellitus (GDM) at booking and its association with age, body mass index (BMI), and ethnicity among at-risk women enrolled in the Treatment of Booking Gestational Diabetes Mellitus (TOBOGM) study.

Methods: Pregnant women with risk factors for hyperglycemia in pregnancy were enrolled at booking (<20 weeks gestation) between June 2017 and May 2018. "GDM" and diabetes in pregnancy (DIP) were diagnosed using the criteria for GDM at 24-28 weeks gestation in the ADIPS 2014 guidelines. "GDM" women were further stratified into low band (fasting 5.1–5.2mmol/L, 1 hour 10.0–10.5mmol/L, 2 hours 8.5–8.9mmol/L), high band (fasting 5.3–6.0mmol/L, 1 hour \geq 10.6mmol/L, 2 hours 9.0–11.0mmol/L), and high fasting glucose (HFG) (fasting 6.1-6.9mmol/l) groups based on the IADPSG odds ratios (ORs) of 1.75 and 2.0 for pregnancy complications of GDM diagnosed at 24-28 weeks gestation.

Results: In 638 pregnant women tested, the prevalence of "GDM" at booking was 24.1%. Among those diagnosed with "GDM", 40.3% were in the low band and 59.7% were in the high band. The prevalence of DIP was 0.6%, with a further 0.6% with HFG. Compared with 'normal' women, women with "GDM" were older ($p<0.001$), heavier ($p<0.001$) and of non-European descent ($p=0.037$). GDM low- and high-band groups were similar except for their mean maternal age (30.6 ± 4.9 vs. 32.5 ± 4.1 years, $p=0.011$). The ORs for "GDM" development were higher in women older than 35 years (OR 3.97 [1.91–8.24]), BMI \geq 35kg/m²

(OR 2.42 [1.46–4.02]) and of non-European descent (OR 1.60 [1.10–2.34]) compared with the young, normal weight, European descent reference group.

Conclusion: Preliminary results indicate that the prevalence of booking “GDM” is high among women at increased risk. The association between traditional risk factors and early “GDM” is high in the TOBOGM cohort.

29

Prophylactic aspirin and fetal growth in diabetic pregnancies

Nely Shrestha Khatri¹, Dorothy Graham¹, Scott White¹

1. King Edward Memorial Hospital, Subiaco, WA, Australia

Background

Current guidelines including those of the World Health Organization recommend low dose aspirin for all pregnant women with pregestational diabetes mellitus to reduce the risk of preeclampsia and small for gestational age babies. A recent secondary meta-analysis of the maternal-fetal-medicine units' high risk aspirin trial¹ found significantly higher rates of large for gestational age births in women with pregestational diabetes without microvascular complications, who had received aspirin prophylaxis compared to those randomised to placebo². In addition, aspirin prophylaxis was not found to reduce the number of small for gestational age neonates.

Aim

To determine whether low dose aspirin use in pregnancy is associated with an increased risk of large for gestational age infants in women with complicated and uncomplicated pregestational diabetes.

Method

A retrospective study of 850 singleton pregnancies in women with pregestational diabetes (type 1 or type 2) delivering at King Edward Memorial Hospital between January 2013 to December 2017. Data was acquired from the midwives STORK database for demographics, ethnicity, parity, BMI, smoking history, pre-existing hypertension and birth weight. Individual patient notes were reviewed to determine duration of diabetes and associated complications, family history of hypertension, aspirin prophylaxis, HbA1c, pregnancy complications, celestone administration and birth complications. Birth centiles were calculated using the GROW calculator.

Statistical analysis will be performed to determine any association between aspirin prophylaxis and small or large for gestational age babies and incidence of preeclampsia in women with complicated and uncomplicated diabetes. This will include multivariate regression to account for potential confounders of birth centile including maternal BMI and level of maternal diabetic control.

Results

Data and conclusions will be presented

1. Caritis S Low-dose aspirin to prevent preeclampsia in women at high risk. National Institute of Child Health and Human Development Network of Maternal Fetal Medicine Units. NEJM 1998; Mar 12; 338 (11): 701-5.
2. Adkins K et al. Impact of Aspirin on fetal growth in diabetic pregnancies according to White classification. Am J Obstet Gynecol 2017; Oct; 217 (4):465e1

30

Should women with diabetes in pregnancy (DIP) undergoing elective caesarean section after 37 weeks receive pre-operative corticosteroids?

Katharine J Gupta¹, David Simmons¹, Felicia King²

1. Macarthur Diabetes Service, Campbelltown Hospital, Campbelltown, NSW, Australia

2. Midwifery, Campbelltown Hospital, Campbelltown, NSW, Australia

Aims

Maternal antenatal corticosteroid administration prior to elective caesarean section (ECS) at < 39.0 weeks gestation reduces neonatal respiratory morbidity. Steroid therapy results in 'difficult to manage' hyperglycaemia in women with DIP, which can increase maternal and/or fetal risk. We have assessed whether neonates from pregnancies requiring ECS, complicated by DIP, between 37.0-38.9 weeks gestation, are at increased risk of respiratory distress (RDS).

Methods

A literature review revealed insufficient evidence that antenatal corticosteroid therapy in women with diabetes was safe and effective. Obstetrics, paediatrics and endocrinology discussed this and agreed that women with DIP would not receive steroids after 36.6 weeks gestation over a 12-month period commencing on the 1st May 2017.

Clinical records provided a list of all women who underwent ECS between 1st May 2016 – 31st August 2016 (period 1) and 1st May 2017 – 31st August 2017 (period 2). All ECS occurring at ≤ 36.6 weeks gestation and ≥ 39 weeks gestation were excluded. A retrospective manual audit of these files was undertaken. The full audit is nearing completion: initial data are shown here.

Results

Thirty-four women (15 DIP) underwent an ECS having received antenatal steroids in period 1. Four (26.7%) babies of DIP mothers were admitted to the SCN with RDS and 2 (13.3%) with hypoglycaemia. In comparison, during period 2, 52 women underwent an ECS (17 DIP). Only 2 (11.8%) babies of DIP mothers were admitted to the SCN with RDS and 2 babies (11.8%) with hypoglycaemia.

Conclusions

Early results suggest that women with DIP undergoing ECS from 37.0-38.6 weeks gestation without prior steroid therapy are not likely to have a greater risk of RDS. Full results will soon be available.

31

Impact of continuous glucose monitoring on perinatal costs and outcomes in pregnant women with type 1 diabetes: A cost analysis based on the outcomes of the CONCEPTT trial.

Doug Symonds¹, Will Sierakowski², Dominic Tilden²

1. Medtronic Australasia, Macquarie Park, NSW, Australia

2. THEMA Consulting Pty. Ltd., Pyrmont, NSW, Australia

Aims:

This study compares monitoring costs and perinatal outcomes associated with continuous glucose monitoring (CGM) in addition to blood glucose monitoring (BGM) versus BGM alone when used in pregnant women with type 1 diabetes (T1D). The study was conducted in an Australian healthcare setting to inform decisions to improve access to CGM in this high-risk population.

Methods

Outcome data was derived from the CONCEPTT trial ¹, an open-label, multicentre, randomised controlled study. Maternal and neonatal length of stay (LOS), caesarean births, pre-term births, and extended (>24 hours) neonatal intensive care (NIC) were compared between CGM and control arms of CONCEPTT. Costs are applied from an Australian healthcare perspective.

Results:

CONCEPTT provided strong evidence of neonatal hospitalisation benefits in CGM vs control through reduced neonate length of stay (3.1 vs 4.0; p=0.0091), and a reduced incidence of extended (>24 hours) NIC (0.27 vs 0.43; p=0.0157). Incidence of pre-term births (<37 weeks) was similar (p=0.57) between CGM (38%) and control (42%). CONCEPTT also identified trends in favour of CGM for reduced maternal LOS (3.5 vs 4.2 p=0.1), and reduced incidence of caesarean births, (63% vs 73%; p=0.18).

CGM is subsequently estimated to reduce neonatal hospitalisation costs by \$2,105 (CGM: \$14,679 vs control: \$16,784), and maternal hospitalisation costs by \$1,230 (CGM: \$8,988 vs control \$10,218). The addition of CGM to current standard practice, BGM, is estimated to cost an additional \$2,250 in monitoring costs whilst providing savings of \$3,335 in maternal and neonate hospitalisation costs.

Conclusions:

Evidence from the CONCEPTT trial, applied to an Australian setting, suggests that maternal and neonatal hospitalisation benefits more than offset additional monitoring costs associated with using CGM for the duration of pregnancy in women with T1D. This analysis supports access to CGM for pregnant women with T1D.

1. Feig, D. et al. Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. *Lancet*. 2017 Nov 25;390(10110):2347-2359

32

ADIPS Guidelines

Victoria Rudland^{1,2}

1. Staff Specialist Endocrinologist, Westmead Hospital, Sydney

2. Unit of Study Coordinator, Masters of Metabolic Health, The University of Sydney, on behalf of the ADIPS Diabetes in Pregnancy Guideline Development Group

ADIPS are in the process of updating the 2005 ADIPS Management of Diabetes in Pregnancy Guidelines. In this session, information regarding the update will be presented. There will be a process of wide stakeholder engagement.

33

ADIPS Diabetes in Pregnancy Clinical Audit Programme

David Simmons¹

1. Macarthur Clinical School, Western Sydney University, Campbelltown, Sydney, on behalf of the on behalf of the ADIPS Diabetes in Pregnancy Clinical Audit Working Group

Epidemiological and outcome data from pregnancies complicated by pre-existing diabetes and gestational diabetes are 'patchy' in Australia and New Zealand. There are some centres that retain an ongoing internal audit, while others have no systematic process to review their care. A national clinical audit programme can provide an implementation framework for those centres interested in reviewing and improving their care, and provide benchmarking support for those with established audit activities. ADIPS carried out a pilot study of 3 approaches to clinical audit (paper, stand alone electronic, networked electronic) across 9 different clinical settings (rural, urban, large proportion of indigenous, New Zealand) linked with a Benchmarking Centre in 2007 (*Australian and New Zealand Journal of Obstetrics and Gynaecology* 2007;47:198-206). Based on the findings of that exercise, and developments in the field since, a revised dataset, a data dictionary, a process for de-identification of patients and sites and proposed central data analysis and reporting site protocols have been developed to establish/pilot a clinical audit

in 2018-2019. Aspects of Ethics and Permission need to be identified and defined. Local reports and a national report will be created allowing benchmarking of clinical performance across sites (*and against existing Clinical Guidelines and Best Practice*). The proposed system will only be able to support analysis of De-identified Electronic Data. It may be appropriate to establish systems for Type 1 and Type 2 diabetes only initially, although if GDM data exists, this would likely be possible. The audit process will be offered across all interested sites in Australasia and be undertaken at least every 12 months. A key issue currently is a source of ongoing funding for administration and benchmarking.

Thanks to the working group for their work.

100

An Audit of the impact of a structured document (Proforma) on the quality of patient care in diabetes in pregnancy clinic at Campbelltown Hospital

Adil Bahauddin^{1,2}, **Maryam Sina**³, **David Simmons**^{1,2}

1. Campbelltown Hospital, Campbelltown, NSW, Australia

2. Western Sydney University, Sydney, NSW, Australia

3. Western Sydney University, Sydney, NSW, Australia

Background: Pregnancy in women with pre-gestational Type 1 and 2 diabetes is a rapidly rising clinical challenge. Pregnancies among women with pre-gestational diabetes (PGD) carry a high risk of adverse outcomes. Optimal management of diabetes in pregnancy requires a structured clinical approach. The primary objective of this study was to evaluate the impact on the quality of documentation of healthcare data and the secondary objective was to determine whether using the proforma was associated with improved maternal and fetal outcome in women with pre-gestational diabetes.

Methods: This was a retrospective 2 cycle audit on women with PGD with births between January 2010 and December 2017. The proforma was introduced in January 2016 and a washout period of 5 months from January 2016 to May 2016 inclusive was defined. The patients' notes and electronic medical records were reviewed. The quality of documentation was assessed based on the rate of missing data. Data were analysed using Fisher's exact and ANOVA tests.

Results: 91 and 41 pregnancies were evaluated in the pre and post proforma period respectively. The quality of documentation significantly improved in post-proforma phase with the rate of missing data declining from 100% to 31.7% ($p < 0.001$) for retinopathy progression, 92.3% to 19.5% ($p < 0.001$) for nephropathy progression, and 31.9% to 7.3% ($p = 0.016$) for 3rd trimester HbA1c. Macrosomia significantly reduced in the second cycle (49% vs 21% $p = 0.003$). Rates of caesarean section (54% vs 45% $p = 0.441$), preeclampsia (12% vs 5% $p = 0.324$) and mean 3rd trimester HbA1c (6.8% vs 6.4% $p = 0.155$) were not significantly different.

Conclusion: The quality of documentation improved significantly for a number of variables studied which is likely attributable to the implementation of the proforma. The introduction of the proforma was also associated with a significant reduction in the rate of macrosomia. This was a small study, but it supports the use of structured documentation to help reduce variation in care and potentially improve pregnancy outcomes.

101

A Pilot Randomised Controlled Trial of Text Messaging and Activity Monitors to Improve Health Behaviour After Gestational Diabetes

N Wah Cheung^{1,2}, **Roslyn Hogan**¹, **Caron Blumenthal**³, **Tony Barry**⁴, **Ben Smith**⁵, **Aravinda Thiagalingam**⁴, **Julie Redfern**², **Nancy Cinnadaio**¹, **Clara Chow**^{2,4}

1. Department of Diabetes & Endocrinology, Westmead Hospital, Westmead, NSW, Australia

2. Faculty of Medicine, University of Sydney, Sydney, NSW, Australia

3. Women's and Newborn Health, Westmead Hospital, Westmead, NSW, Australia

4. Department of Cardiology, Westmead Hospital, Westmead, NSW, Australia

5. Sydney School of Public Health, University of Sydney, Sydney, NSW, Australia

Introduction

Interventions involving text messaging have been shown to improve risk factors and HbA1c in people with diabetes. We conducted a pilot randomised controlled trial to determine if a structured program of text messaging interacting with an activity monitor, for women after gestational diabetes (GDM), improves healthy behaviours.

Methods

Women with GDM were recruited and randomised (2:1) to Intervention or Control. The Intervention comprised a 6 month structured program of 4 text messages a week promoting healthy behaviour in conjunction with an activity monitor (Fitbit®). Feedback from the activity monitor tailored the text messages to support gradual attainment of 10,000 steps per day. Attendance for a glucose tolerance test (GTT) by 12 weeks, and weight, diet, and physical activity (PA) at 10 weeks (baseline) and 36 weeks post-partum were assessed.

Results

60 women were recruited with 40 randomised to intervention and 20 to control. There was no difference between the groups in the completion of the GTT by 12 weeks (Intervention 28/40 vs Control 13/20). There was a high drop-out rate and only 30 women completed all elements of the 36 week final evaluation. There was no difference in the achievement of 150 minutes moderate intensity PA a week (7/20 vs 3/10, $p = 1.0$), weekly step count (46258±29189 vs 39658±16369, $p = 0.40$), dietary fat intake $\leq 30\%$ of energy (4/23 vs 4/11, $p = 0.39$) and weight loss (-1.7±4.1 vs -1.1±3.3 kgs, $p = 0.47$) at 6 months. There was a difference in total energy intake (7760±2878 vs 8322±1726 kJ, $p = 0.045$), and a trend to higher total weekly activity time (190±306 vs 127±128 minutes, $p = 0.17$).

Conclusion

Our pilot study demonstrates proof of concept that linking activity monitors to healthy text messages is feasible, but in this population, maintaining participation is challenging. The modest number of subjects completing the study limited statistical power but the trend to improvement in some outcomes suggests that a larger study is worth conducting.

102

Subcutaneous insulin protocol following antenatal steroids for women with diabetes in pregnancy

Sheng-Tsung (Dominique) Chiu¹, Catherine Marnoch², Janet Rowan²

1. Northland District Health Board, Whangarei, NORTHLAND REGION, New Zealand

2. Obstetric Medicine, Auckland District Health Board, Auckland, Not in US or Canada, New Zealand

Background: The National Institute for Health and Clinical Health Excellence (NICE) guideline recommends that diabetic mothers should receive additional insulin when antenatal corticosteroid is indicated. In 2013 a modified insulin protocol was developed in Waitemata District Health Board (WDHB) in New Zealand for diabetic mothers requiring antenatal corticosteroid therapy.

Aim: This audit aims to review the effectiveness of the WDHB protocol in achieving satisfactory glycaemic control.

Methods: Diabetic women who received antenatal corticosteroid between March 2013 and March 2015 in WDHB were identified retrospectively. Through clinical records insulin prescription, glycaemic monitoring and staff adherence to protocol were recorded in three time periods: *One*: 0-8 hours after initial injection (11.4 mg betamethasone, im); *Two*: 8 hours after initial injection to 24 hours after second injection; *Three*: 24-36 hours after second injection. During time period *two*, insulin doses were doubled or initiated at 0.7-1.0 unit/kg/day.

Results: In 44 cases, no woman maintained glucose measures between 4-6 mmol/L. In time periods *one*, *two* and *three*, 90%, 48% and 90% of women maintained blood sugar levels between 3.5-10 mmol/L, respectively. Hyperglycaemia of greater than 6.0 mmol/L occurred in more than half of the patients in each time period, however, an additional insulin dose was not always provided as recommended. Mild hypoglycaemia (less than 3.5 mmol/L) occurred four times.

Conclusion: Our results suggest that, for women already taking insulin, doubling the dose was safe in our population. In general, the WDHB protocol was effective although insulin doses could have been higher.

103

Attitudes to Diet and Exercise in Women Attending Gestational Diabetes Services with an Examination of the Impact of Culturally and Linguistically Diverse Backgrounds

Shamir D Cooray^{1,2}, Helena J Teede^{1,2}, Jacqueline A Boyle^{1,3}, Carolyn A Allan^{4,5,6}, Georgia Soldatos^{1,2}

1. Monash Centre for Health Research and Implementation, Monash University, Melbourne, Victoria, Australia

2. Diabetes and Vascular Medicine Unit, Monash Health, Melbourne, Victoria, Australia

3. Monash Women's Services, Monash Health, Melbourne, Victoria, Australia

4. Department of Obstetrics and Gynaecology, Monash University, Melbourne, Victoria, Australia

5. Department of Endocrinology, Monash Health, Melbourne, Victoria, Australia

6. Department of Obstetrics & Gynaecology, Monash University, Melbourne, Victoria, Australia

Increasing numbers of women born overseas are presenting for care of Gestational Diabetes Mellitus (GDM). This pilot study sought to understand the attitudes towards diet, exercise and risk perception of future diabetes, with emphasis on women from culturally and linguistically diverse (CALD) backgrounds. Women who had recently been diagnosed with GDM were recruited (n=133) into 3 groups: 1) non-CALD women- born in Australia, English primary language (n= 52); 2) CALD women- born overseas, English primary language (ES-CALD, n= 55) and 3) CALD women- born overseas, English not primary language (NES-CALD, n= 26). Interpreters assisted participants in the NES-CALD group. The planned sample size of 500 was not achieved due to limitations in funding. Women were from 19 different countries of birth with 27 primary languages. Mean age was consistent across the groups (31.8± 5.1 years). NES-CALD women were less likely to identify their future risk of type 2 diabetes (77%) compared with ES-CALD (38%; p= 0.001) and non-CALD (37%; p= 0.001). Most NES-CALD women did not appreciate the benefit of a healthy diet on controlling blood glucose levels (62%), a greater proportion than ES-CALD (27%, p= 0.003) or non-CALD women (25%, p= 0.002). More women in the NES and ES-CALD groups cited lack of information as a barrier to a healthy diet (22% and 23%) compared to non-CALD women (6%, p=0.02 and 0.02, respectively). A greater proportion of women in both CALD groups also identified more information about healthier food choices (71% and 69%) and increased support from midwives and doctors (40% and 62%) as factors that would promote a healthier diet during pregnancy compared to non-CALD women (15% and 32% respectively, p≤0.002). These data demonstrate the need to better understand the specific education requirements of women attending GDM services, and the importance of developing ethnically, culturally and linguistically sensitive and appropriate education, support and treatment.

A cross-sectional survey of gestational diabetes management in Queensland

Nina Meloncelli², Adrian Barnett, Susan de Jersey¹

1. Dietitian, Queensland, Australia
2. Dietitian, Sunshine Coast University Hospital, QLD, Australia

In 2015, Queensland Health published a Clinical Guideline for gestational diabetes mellitus (GDM) which included updated screening and diagnostic criteria and comprehensive recommendations for the multidisciplinary management of GDM. While it is understood that the updated criteria has resulted in increased GDM diagnosis, it is unknown whether resources or service delivery has changed or whether health services implemented the Guideline. The aim of this study was to examine the staff resourcing, models of care, level of Guideline implementation, and barriers and enablers to implementing the Guideline across Queensland Health GDM services. A 22-item electronic questionnaire was sent to Queensland Health facilities between August and October 2017 with follow-up phone calls for questions involving staff resourcing. There were 53 respondents across 14 Queensland Hospital and Health Services (HHS) included. Regarding staff resourcing, 64% of the HHS had 0.1 full time equivalent (FTE) staff hours or less available for a diabetes educator and 93% had less than 0.1 FTE for a dietitian. The FTE allocated for endocrinologists or physicians ranged from 0.0 – 0.6 FTE, with 0.2 FTE the most common. Many rural and remote sites relied on telehealth to access specialist care. Between 2014 and 2016, 8 out of 14 HHS had some increase to FTE. Full implementation of the GDM Guideline was reported by 41% of Metropolitan compared with 29% for regional and 25% for rural/remote services. Guideline recommendations of physical activity advice, minimum schedule of dietetics appointments and psychosocial support were inconsistently delivered. The most common barrier to guideline implementation was staff resourcing (85%), whereas enablers included the staff or team work (42%), staff resourcing (21%), local protocols (21%) and education/knowledge (15%). This survey is an important step to understanding the gaps in GDM service and management across Queensland and the use of clinical guidelines. Equity of access to best practice care GDM across geographic regions likely requires greater resources and a greater understanding of effective models of care.

Increased resources for GDM improves access to best practice dietetic care

Susan de Jersey^{2,1}, Taylor Guthrie², Hui Shi Liow³, Natasha Lorenzen²

1. Visiting Research Fellow, School of Exercise and Nutrition Sciences, Queensland University of Technology, Brisbane, Qld, Australia
2. Dietitian, Queensland, Australia
3. Former Student, School of Exercise and Nutrition Sciences, Queensland University of Technology, Brisbane, Qld, Australia

Background: Gestational diabetes mellitus (GDM) diagnosis has almost doubled in recent years with significant resource implications. Clinical practice guidelines recommend medical nutrition therapy provided by a dietitian as the cornerstone and first line treatment for GDM. Few studies have evaluated the impact of dietetic resourcing on ability to meet Nutrition Practice Guidelines (NPG's) or maternal and fetal outcomes.

The aim of this clinical audit was to evaluate the impact of increased dietetic resourcing on achieving NPG's of an initial appointment within one week of referral, and a minimum of three dietetic visits during pregnancy, and investigate the influence this had on selected maternal and foetal outcomes.

Materials and Methods: A consecutive sample of women with newly diagnosed GDM using IADPSG criteria were audited between two time periods, December 2014 to March 2015 (2015 study cohort, n=139), and December 2015 to March 2016 (2016 study cohort, n=153). The participating hospital had increased dietetic resourcing after the 2015 study cohort to cope with the rising prevalence of GDM women. All information required were collected from routine hospital data sources.

Results: Increased resourcing was associated with improvements to the proportion of women being seen within a week of referral (53% vs 84%, p<0.001) and receiving at least 3 dietetic visits (69% vs 79% p=0.068). Pharmacotherapy was reduced from 41% in 2015 to 34% in 2016. After controlling for previous GDM history, ethnicity and BMI, a reduction in neonatal hypoglycaemia (15% 2015, 1% 2016) remained significant.

Conclusions: The increased dietetic resourcing improved women's access to best practice care for education initiation and dietetic review and appears to have a positive influence on neonatal hypoglycaemia. Confirmation of these results in larger samples is required.

Pregnancy outcomes among women with type 1 diabetes mellitus using continuous subcutaneous insulin infusion versus multiple daily injections; a retrospective cohort study

Benjamin RS Dixon¹, Alison Nankervis¹, Stephanie C N Hopkins¹, Tom J Cade¹

1. Royal Women's Hospital, Parkville, VIC, Australia

Background: For women with type 1 diabetes in pregnancy, the mainstay insulin management options are continuous subcutaneous insulin infusion and multiple daily injections. Existing studies have found either inconclusive, inconsistent, and occasionally contradictory results. Without clear evidence for clinicians, pregnancy outcomes of each insulin management option have not been evaluated in a large single-centre cohort.

Objective: To compare pregnancy outcomes in women with type 1 diabetes mellitus using multiple daily injections or continuous subcutaneous insulin infusion in pregnancy.

Study Design: Retrospective cohort study of pregnancies booked between January 2006 and December 2016, at the Royal Women's Hospital, Melbourne, Australia; a large subspecialty tertiary hospital. The population included 298 singleton pregnancies reaching 20 weeks gestation of adult women with pre-existing type 1 diabetes mellitus using continuous subcutaneous insulin infusion or multiple daily injections. Outcomes of interest included obstetric and neonatal outcomes, and HbA1c values through pregnancy. Descriptive statistics analysed baseline maternal characteristics between groups. Multivariable logistic regression models were then developed from univariable logistic regression to compare selected pregnancy outcomes.

Results: Women with type 1 diabetes mellitus using continuous subcutaneous insulin infusion in pregnancy were at a higher risk of having a large-for-gestational age >90th centile neonate [adjusted odds ratio (aOR) 2.00, 95% confidence intervals (CI) 1.20-3.34], a large-for-gestational age >95th centile neonate [aOR 2.05, 95% CI 1.22-3.45], and preterm birth [aOR 1.80, 95% CI 1.04-3.03]. Specifically, no adverse outcomes associated with large-for-gestational age or preterm deliveries were observed in the continuous subcutaneous insulin infusion cohort, and all other maternal and neonatal outcomes were comparable. HbA1c values were similar between groups pre-conception and at each trimester.

Conclusion: Continuous subcutaneous insulin infusion use during pregnancy in women with type 1 diabetes mellitus is associated with an increased risk of large-for-gestational age and preterm neonates, without an accompanied increase in risk of adverse maternal or neonatal outcomes.

108

Gestational Diabetes Mellitus in Fiji - A single hospital based study of Prevalence and birth outcomes

Falahola Fuka¹, Rajat GyaneshwaR², Swaran Naidu², Julia Singh³, Nola Mahe⁴, Iisapeci Kubuabola⁵, Uchechukwu Levi Osuagwu⁶, David Simmons⁶, James Fong³

1. *Obgynae, Ministry of Health, Nukualofa, Tonga*

2. *Obgynae, Ministry of Health, Lautoka, Fiji*

3. *Obgynae, Ministry of Health, Suva, Fiji*

4. *Ict, Who, Suva, Fiji*

5. *C-Pond, Fiji National University, Suva, Fiji*

6. *Medicine, Western Sydney University, Campbelltown, NSW, Australia*

Aim Estimates of gestational diabetes mellitus (GDM) vary widely because of varying diagnostic criteria. Screening of pregnant women using modified (fasting+2 hour glucose only) International Association of Diabetes and Pregnancy Study Group criteria (IADPSG) has been available in Fiji since 2013. This study is the first hospital-based, analysis of the screening coverage and the resulting one-year prevalence. Prior prevalence (2009-2013) using the 1998 ADIPS criteria was relatively stable at ~1.4%.

Methods Women attended the antenatal clinic of the Colonial War Memorial Hospital (CWMH) in Suva (2013 -14) for 2 hr 75g oral glucose tolerance test (OGTT) or 50g Glucose Challenge Test \geq 7.8mmol/L and OGTT if at high/low risk of GDM. GDM diagnosed if fasting glucose \geq 5.1 mmol/L and/or 2hr \geq 8.5mmol/L unless diabetes in pregnancy (*DIP*) was present (fasting \geq 7.0 mmol/L and/or 2hr \geq 11.1 mmol/L). Obesity was defined as BMI \geq 30kg/m². Demography, risk factors (positive family history of diabetes, history of GDM, baby>4000g, still birth and neonatal death) and clinical data were extracted, retrospectively. The prevalence pre and post- IADPSG implementation and the categorical data were calculated.

Results Of the 8628 singleton births (women aged 38 \pm 2yrs), 301(3.4%) had diabetes: GDM/DIP/pre-existing DM 2.4%/0.5%/0.1%, respectively and 0.4% unretrieved records. The age-specific prevalence of GDM was 0.5%, 1.8%, 0.6% for 16-25, 26-35 and >35 years, respectively, 63% were obese, 66% had either any risk factor (51%) or 2/more risk factors (15%), mostly strong family history (51%). The mean gestational age at delivery was 38.5 \pm 2.1wks (GDM 38.6 \pm 2.0 vs *DIP* 37.7 \pm 2.3 p<0.05). Compared with non-diabetes, GDM women had significantly higher risks of caesarean section (OR=2.26; 95%CI:1.72/2.95), hypertensive disorder (OR=4.68; 3.34/6.47), stillbirth (OR=13.08; 7.65/21.7) but similar neonatal death risk. Higher birthweight for neonates with shoulder dystocia (4442g vs 3417g; p<0.001) with 20% of those with macrosomia (>4.0kg birthweight) developing shoulder dystocia.

Conclusion. Adopting the modified IADPSG criteria at the CWM hospital increased the prevalence of GDM (3.4%) and identified women at increased risk of adverse pregnancy outcomes in Fiji.

Key Words: International Association of Diabetes and Pregnancy Study Group's criteria (IADPSG), Gestational Diabetes (GDM), Prevalence, Diabetes in Pregnancy, Macrosomia, Shoulder Dystocia.

109

SHIFT – Significance of mild Hyperglycaemia In First Trimester pregnancy

Alison Gebuehr¹, Emma Croker¹, Margaret Harris², Andrew Woods³, Katie Wynne^{1, 2, 4}

1. *Department of Diabetes & Endocrinology, John Hunter Hospital, Newcastle, NSW, Australia*

2. *Faculty of Health and Medicine, University of Newcastle, Newcastle, NSW, Australia*

3. *Department of Obstetrics and Gynaecology, John Hunter Hospital, Newcastle, NSW, Australia*

4. *Hunter Medical Research Institute, Newcastle, NSW, Australia*

Introduction

Glucose testing is performed in early pregnancy to identify women with undiagnosed overt diabetes.^{1,2} Glucose levels considered diagnostic of gestational diabetes (GDM) at 24-28 weeks gestation may be present in the first trimester, but it is unclear if this predicts GDM, or if treatment of these women improves materno-foetal outcomes.^{3,4,5,6}

Method

A prospective observational audit (January to December 2017) was performed of women referred to our service with fasting plasma glucose (FPG) 5.1-6.9mmol/l in the first trimester. Women with pre-existing diabetes, overt diabetes, twin pregnancy, and those taking diabetes medication were excluded. Demographic data was collected. Women were categorised based on FPG as having lower glucose (LG: 5.1-5.5mmol/l) or higher glucose (HG: 5.6-6.9mmol/l) levels. Pre-specified maternal and foetal outcomes were recorded.

Results

Twenty-six women were included in the analysis (LG n=17; HG n=9). Women in the HG group were more likely to have BMI>30kg/m² (89% vs 41% p=0.04). A subsequent diagnosis of GDM was made in 78% HG women and 59% LG women in 2nd/3rd trimester; higher than local population prevalence of (17%).

The neonates of HG women were of similar weight (3419±454gm) to those of LG women (3683± 440gm; p=0.16). Average birth-weight (3592±462gm) was higher when compared to neonates born to women with treated T2DM in our unit (n=49 3077± 954gm; p=0.01).⁷

Macrosomia (birth-weight ≥4kg) did not occur in HG neonates, but was present in 24% of LG neonates. Adverse neonatal outcomes (composite of neonatal intensive care admission, respiratory distress or requirement of continuous positive airway pressure and shoulder dystocia) occurred in 22% HG group and 53% LG group (p=0.42).

Conclusion

This data suggests that early fasting hyperglycaemia may not be a benign condition. A high proportion of women went on to develop GDM. Neonates had a higher birth-weight when compared to women with treated T2DM; adverse outcomes were seen frequently in both HG and LG women. Further studies are needed to guide the management of these women.⁶

1. 1. Nankervis A, McIntyre HD, Moses R, et al. ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia and New Zealand. Nov 2014. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf
2. 2. International Association of Diabetes and Pregnancy Study Groups Consensus Panel. International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care* 2010; 33: 676-682.
3. 3. Zhu W. W., Yang H. X., Wei Y. M., et al. Evaluation of the value of fasting plasma glucose in the first prenatal visit to diagnose gestational diabetes mellitus in China. *Diabetes Care*. 2013;36(3):586–590. doi: 10.2337/dc12-1157
4. 4. Sweeting A. N., Ross G. P., Hyett J., et al. Gestational diabetes mellitus in early pregnancy: evidence for poor pregnancy outcomes despite treatment. *Diabetes Care*. 2016;39(1):75–81. doi: 10.2337/dc15-0433.
5. 5. Corrado F., D'Anna R., Cannata M. L., Interdonato M. L., Pintaudi B., Di Benedetto A. Correspondence between first-trimester fasting glycaemia, and oral glucose tolerance test in gestational diabetes diagnosis. *Diabetes & Metabolism*. 2012;38(5):458–461. doi: 10.1016/j.diabet.2012.03.006
6. 6. Simmons, D., Hague, W., Teede, H., Cheung, N., Hibbert, E., Nolan, C., Peek, M., Girosi, F., Cowell, C., Wong, V., Flack, J., McLean, M., Dalal, R., Robertson, A. and Rajagopal, R. (2018). Hyperglycaemia in early pregnancy: the Treatment of Booking Gestational diabetes Mellitus (TOBOGM) study. A randomised controlled trial. [online] *Mja.com.au*. Available at: <https://www.mja.com.au/journal/2018/209/9/hyperglycaemia-early-pregnancy-treatment-booking-gestational-diabetes-mellitus> [Accessed 29 May 2018].
7. 7. Joshi, T., Mcelduff, S., Lewis, M. and Wynne, K. (2015). Poor neonatal outcomes in mothers with T1 diabetes compared to T2 diabetes. In: ADIPS ASM. [online] .Oral presentation and Poster. Available at: <http://www.adipsasm.org/assets/ADIPS/ADIPS-Program-for-web-Final-2.pdf>

Enhanced Dietetics Service for Gestational Diabetes Mellitus and Improvement in Pregnancy Weight Gain

Claire Harper¹, Kylie Smythe¹, May Mak¹, Vincent Wong²

1. *Department of Dietetics, Liverpool Hospital, Sydney, NSW, Australia*

2. *Diabetes and Endocrine Service, Liverpool Hospital, Sydney, NSW, Australia*

Background: Medical nutrition therapy (MNT) is the first line treatment for women with Gestational Diabetes Mellitus (GDM). Dietetic input is essential to help women meet nutrient requirements, achieve glycaemic targets and meet weight gain recommendations. South Western Sydney has one of the highest prevalence of GDM in New South Wales. Prior to 2016 at Liverpool Hospital, MNT was delivered in a group setting at the time of diagnosis. Following that, the women were referred for an individual review by the dietitian on an “as-needed” basis. In 2016, additional funding for a dietitian was granted at our institution to facilitate individual dietetic reviews for women with GDM.

Aim: To assess the impact of dietetic enhancement on weight management for women with GDM.

Method: Weight gain data for women with GDM in the 12 months prior to the dietitian enhancement (2015) was compared to weight gain data in the 12 months post enhancement (2017).

Results: In 2015, 72% of women had an individual dietitian review, but in 2017 this was increased to 92%. There was a significant decrease in the mean total weight gain for women with GDM in the 2017 cohort compared to 2015 (10.6±5.7kg vs

12.0±8.3kg, p=0.024). The mean weight gain in the 2017 cohort was also more in line with the Institute of Medicine (IOM) weight-gain guidelines for women who were overweight: for body mass index (BMI) 25.0-29.9kg/m² (10.5±5.3kg vs 12.9±6.6kg, p=0.013) and BMI >30.0kg/m² (8.8±6.1kg vs 11.1±8.5kg, p=0.036). For women with a BMI of less than 18.5kg/m² and BMI 18.5-25kg/m², the mean weight gain for both cohorts remained within the recommended weight gain range. There was no difference in pregnancy outcomes between the 2 cohorts.

Conclusion: Enhanced dietetic services were associated with improved weight management for the women involved in this study. The findings support continuation of the service and demonstrate the potential benefit that enhanced dietetic services may provide for women treated for GDM in other settings.

111

Comparison of Pre-Diagnosis Dietary Intake of Women Diagnosed with Gestational Diabetes Mellitus to Dietary Recommendations

Claire A Harper¹, Kylie Smythe¹, Vincent Wong², Megan E Rollo^{3,4}, Clare E Collins^{3,4}

1. Department of Dietetics, Liverpool Hospital, Sydney, NSW, Australia

2. Diabetes and Endocrine Service, Liverpool Hospital, Sydney, NSW, Australia

3. School of Health Sciences, Faculty of Health and Medicine, University of Newcastle, Newcastle, NSW, Australia

4. Priority Research Centre in Physical Activity and Nutrition, Faculty of Health and Medicine, Newcastle, NSW, Australia

Background: The prevalence of Gestational Diabetes Mellitus (GDM) has increased in South West Sydney from 15.3% in 2013 to 21.5% in 2017. While diet is a cornerstone of GDM management, little has been reported on pre-GDM dietary intake. Improved understanding of the dietary intakes of women prior to treatment would allow Medical Nutrition Therapy (MNT) to be targeted to common nutrition issues, particularly in a region with high cultural diversity.

Aim: To evaluate the diet quality, percentage of energy from nutrient-dense core versus energy-dense, nutrient-poor, non-core food groups and intakes of micronutrients in women newly diagnosed with GDM.

Method: Dietary intake pre-GDM was assessed using the Australian Eating Survey (AES), a validated food frequency questionnaire. The AES was self-administered before attending group dietary education at a diabetes outpatient clinic in a tertiary hospital in New South Wales. Diet quality was evaluated using the Australian Recommended Food Score (ARFS) which assesses variety within core food groups. Nutrient intakes were compared to Estimated Average Requirements (EARs).

Results: 50 women completed the survey; mean (SD) age = 30.9 (4.7) years, pre-pregnancy BMI = 28.9 (9.0) kg/m² and 24.6 (6.5) weeks gestation. A variety of cultural backgrounds were represented with 69% born overseas and 9.6% requiring an interpreter. The mean (SD) total ARFS was 31.7 (±11.4) points (maximum 73) with mean (SD)/maximum points ARFS sub-scale scores for vegetables 10.1 (5.4)/21, fruit 6.3 (2.8)/12, meat 2.8 (1.7)/7, meat alternatives 2.4 (1.3)/6, bread and cereals 5.2 (2.1)/13 and dairy products 3.7(2.5)/11. The % energy from core foods was 64.2 ±12.5%, whereas non-core foods contributed 35.8 ±12.5% energy. Mean iron and folate intakes were below EARs.

Conclusions: Women with GDM have low dietary variety of nutrient-dense foods, with a high percentage of energy derived from energy-dense, nutrient-poor foods, along with inadequate intakes of iron and folate. These dietary intake patterns are suboptimal in terms of achieving optimal diet-related health outcomes and require attention within MNT for GDM.

112

Perceptions of physical activity during pregnancy of women diagnosed with gestational diabetes mellitus

Anne L Harrison^{2,1}, Nicholas F Taylor^{2,3}, Helena C Frawley^{4,5}, Nora Shields^{2,6}

1. Physiotherapy, Mercy Hospitals Victoria Ltd, Melbourne, Victoria, Australia

2. La Trobe University, Melbourne, Victoria, Australia

3. Allied Health Clinical Research Office, Eastern Health, Box Hill, Victoria, Australia

4. Centre for Allied Health Research and Education, Cabrini Health, Melbourne, Victoria, Australia

5. Department Physiotherapy, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, Victoria, Australia

6. Northern Health, Melbourne, Victoria, Australia

Aim: To explore the perceptions of women diagnosed with gestational diabetes mellitus (GDM) to physical activity during pregnancy.

Design: A qualitative study, using Interpretative Description as the theoretical framework, was completed.

Method: Pregnant women diagnosed with GDM were recruited based on purposive sampling. The inclusion criteria were women diagnosed with GDM, aged 18 to 40 years, experiencing an uncomplicated singleton pregnancy and able to communicate in English. Recruitment continued until data saturation was achieved. Semi-structured interviews were used to collect data. Interviews were recorded, transcribed verbatim and returned to participants for member checking. Qualitative data were analysed thematically using an inductive method by three researchers independently. Data coding was iterative; data were coded, compared and themes developed, discussed and defined. Emergent themes were sent to participants and peer-reviewed for validation. Participant demographic data were descriptively analysed.

Results: Twenty seven women, mean age 32 years (± 3), mean gestation 30 weeks (± 5), mean pre-pregnancy BMI 26 kg / m² (± 5) and born in 10 different countries, participated. The process of communicating information about physical activity (messaging) was the main theme that emerged. Subthemes included 'who' (information about physical activity in pregnancy needed to be from credible sources), 'what' (what type and how much physical activity was safe and relevant for their GDM pregnancy), 'when' (at GDM diagnosis which triggered women's desire to be more physically active), 'why', (positive effects of

physical activity on pregnancy outcomes was a key motivator), and 'how', (flexible, convenient, individually-tailored physical activity options).

Conclusion: Women diagnosed with GDM expressed the need for messaging of information about physical activity to be, relevant to their GDM pregnancy so they felt confident and safe, directly related to pregnancy outcomes for a GDM pregnancy, delivered by a credible source and flexible so it could be tailored to fit in with their busy lifestyles.

113

Can women with gestational diabetes be triaged based on their HbA1c measurement taken at booking?

Ruth Hughes¹, Jonathan Williman², Joanna Gullam³

1. Canterbury District Health Board, Christchurch, New Zealand

2. Biostatistics and Computational Biology Unit, University of Otago, Christchurch, New Zealand

3. Department of Obstetrics and Gynaecology, University of Otago, Christchurch, New Zealand

Aims: As the incidence of gestational diabetes (GDM) increases there is a move towards nurse specialist led clinics. Our aim was to examine the utility of the HbA1c measurement taken at booking in predicting the pregnancy outcomes of women with GDM, with a view to using the HbA1c measurement to aid triage.

Methods: Observational cohort study of women with GDM by NZ criteria referred to Christchurch Hospital over 18 months. Women without booking bloods and those with multiple pregnancies were excluded. Maternal characteristics and pregnancy outcome data were collected from electronic hospital records. HbA1c measurements were converted to customised centiles (adjusted for gestational week at testing). ^[1] Glucose treatment targets were <5.0mmol/l fasting, <7.4mmol/l at one hour.

Results: Included were 446 women with HbA1c measurements taken at a mean (SD) 56 (29.4) days gestation. HbA1c centiles increased with maternal BMI and correlated with glucose values at the diagnostic glucose tolerance test. 94 (21%) of women had a HbA1c $\leq 10^{\text{th}}$ centile (mean \pm SD HbA1c 29 \pm 1.9mmol/mol) and 166 (37%) had a HbA1c $\leq 25^{\text{th}}$ centile (mean \pm SD HbA1c 30 \pm 2mmol/mol) at booking. Comparing women with a HbA1c $\leq 10^{\text{th}}$ or $\leq 25^{\text{th}}$ centile to those with $\geq 90^{\text{th}}$ centile (mean \pm SD HbA1c 41 \pm 2.4mmol/mol): GDM was controlled with diet only in 48.9% or 44.6% vs 11.9% ($p < 0.001$) respectively and emergency caesarean section occurred in 14.9% or 14.5% vs 26.2% ($p = 0.06$) respectively. There was no difference in neonatal outcomes between groups.

Conclusions: HbA1c centiles at booking may be a useful tool when triaging women with GDM with respect to the likely treatment required. Women with lower HbA1c centiles ($> 1/3^{\text{rd}}$ of our cohort) were more likely to require dietary intervention alone and thus more suitable for initial review in nurse specialist led clinics. We are currently analysing the data to see which of HbA1c centiles vs HbA1c values vs glucose values on the GTT is better for predicting pregnancy outcomes.

1. [1] Hughes RCE, Williman JA, Gullam JE. Antenatal haemoglobin A1c centiles: does one size fit all? Aust N Z J Obstet Gynaecol. 2017

114

Retrospective Audit of Pre-gestational and Gestational diabetes women receiving betamethasone at Bankstown-Lidcombe Hospital.

Ahmed Hussein^{2,1}, Tang Wong^{3,1}, Ronia Awick⁴, Karen Harris^{3,4,5}, Jeff Flack^{3,2,1}

1. Department of Diabetes and Endocrinology, Bankstown-Lidcombe Hospital, Sydney, NSW, Australia

2. Western Sydney University, Sydney, NSW, Australia

3. University of New South Wales, Sydney, NSW, Australia

4. Maternity and Birthing Unit, Bankstown-Lidcombe Hospital, Sydney, NSW, Australia

5. Department of Obstetrics and Gynaecology, Bankstown-Lidcombe Hospital, Sydney, NSW, Australia

Introduction: Antenatal corticosteroids are used to accelerate lung maturity for several obstetric indications, including pre-term labour¹. Betamethasone has the propensity to cause significant hyperglycemia, particularly in women with pre-gestational or gestational diabetes mellitus (GDM). This highlights the need for glycemic monitoring and involvement of the endocrine team to determine and institute appropriate glycaemic management strategies to prevent maternal hyperglycaemia.

Aim: We sought to evaluate current practice at Bankstown-Lidcombe Hospital with the aim of developing appropriate guidelines around betamethasone administration in pregnancy to ensure best practice.

Methods: We performed a retrospective audit of maternal records from May 2017 to May 2018 in consecutive women with pre-gestational diabetes or GDM receiving antenatal betamethasone. An equal number of pregnant women with normal glucose tolerance (also receiving betamethasone) acted as controls. Women requiring urgent betamethasone before an emergency caesarean section were excluded.

Results: There were 23 women in each group, with baseline characteristics shown in Table 1.

Table 1 Baseline Characteristics

	Pre-gestational DM/GDM n=23 mean \pm SD	Control n=23 mean \pm SD	P value
Maternal Age (years)	29.8 \pm 6.0	30.5 \pm 5.0	NS
Maternal Weight (kg)	84.6 \pm 14.2	71.3 \pm 16.6	<0.01
Gestational Age at betamethasone administration (weeks)	36.6 \pm 2.1	36.3 \pm 2.4	NS
Gestational Age at Delivery (weeks)	37.6 \pm 0.5	37.4 \pm 1.4	NS

Identified areas for improvement were: timing of betamethasone administration, initiation of glucose monitoring and early involvement of the endocrine team prior to betamethasone administration. Significant hyperglycaemia was experienced in 22/23 pre-gestational DM/GDM women (95.7%), and severe hyperglycaemia (postprandial >10.0 mmol/L) in 4/23 women (17.4%). The median time between betamethasone administration and delivery was 2.8days (Range 0.0-67.2days). Table 2 includes other findings.

Table 2 Current practice and betamethasone administration.

	Number of cases n=23 (%)
Was the patient admitted for betamethasone?	19 (82.6)
Was betamethasone administered before 9am?	2 (8.7)
Was the endocrine team contracted before betamethasone administration?	10 (43.4)
Was blood glucose tested before betamethasone administration?	8 (34.8)
Was the endocrine team contacted at all?	19 (82.6)
Was the glucose lowering therapy adjusted?	18 (78.3)
Was hyperglycaemia experienced (>3 above target)?	22 (95.7)
Was severe hyperglycaemia experienced (>10mmol/L)?	4 (17.4)
Was blood glucose monitored 4-8 hours post betamethasone administration?	20 (87.0)
Were blood glucose levels checked at least 4x daily	17 (73.9)
Were blood glucose levels monitored for at least 48 hours after the last betamethasone dose.	18 (78.3)

All but one Pre-gestational diabetes/GDM woman had delivered at the time of data collection. Neonatal hypoglycaemia was more common in Pre-gestational diabetes/GDM women, compared to NGT women 54.5% vs 17.4% (OR 5.7, 95% CI 1.5–22.2), despite no significant difference in birthweight or macrosomia rates. Results are summarised in Table 3.

Table 3 Outcomes

	Pre-gestational DM/GDM n=22 Mean \pm SD or Cases (%)	Control n=23 Mean \pm SD or Cases (%)	p-value
Birth Weight (grams)	3266 \pm 559	3922 \pm 582	NS
Macrosomia (>4000g)	2 (9.1)	0 (0.0)	NS
Low birth weight (<2500g)	2 (9.1)	5 (21.7)	NS
Premature Delivery (<37 weeks)	2 (9.1)	4 (17.4)	NS
Neonatal hypoglycaemia	12 (54.5)	4 (17.4)	<0.01
NICU/SCN admission	10 (45.5)	7 (30.4)	NS

Conclusion:

Our audit demonstrated that a structured guideline of glycaemic monitoring and management is required for pre-gestational DM and GDM women having betamethasone therapy. These women are at high risk of hyperglycaemia following betamethasone administration and their infants at high risk of neonatal hypoglycaemia.

1. 1. Miracle X, Di Renzo GC, Stark A, Fanaroff A, Carbonell-Estrany X, Saling E. Coordinators Of World Association of Perinatal Medicine Prematurity Working Group. Guideline for the use of antenatal corticosteroids for fetal maturation. *J Perinat Med.* 2008;36:191–6.

115

Trends in the prevalence of diabetes in pregnant women and its risk factors: a large, population-based study in Sydney, 2011-2017

Marjan Khajehei¹

1. *Westmead hospital, Westmead, NSW, Australia*

Aim: To assess changes in the prevalence and risk factors of diabetes in pregnant women from 2011 to 2017.

Methods: In this retrospective study using women's records from ObstetriX, data from 38,851 pregnant women who attended Westmead Hospital (2011-2017) were considered for evaluation. The data were transferred from ObstetriX into an Excel datasheet. After cleaning, formatting and coding the data, they were entered into SPSS for statistical analysis. Incomplete or out of range records were excluded from the study.

Results: Out of 38,851 pregnant women, 4,672 (12%) had gestational diabetes and 462 (1.2%) had pre-existing diabetes. Assessment of the trend of diabetes in the general population of pregnant women showed a steady increase in gestational diabetes (5%) and an increase of 1% in pre-existing diabetes from 2011 to 2017.

Among pregnant women with diabetes during pregnancy (n=5,134), there were increases in the prevalence of endocrine diseases (by 6%), multiparity (by 5%) and Body Mass Index>35 (by 5%) from 2011 to 2017 (p<0.05).

Despite increases in the prevalence of renal diseases (3%), overseas-born women (2%) and auto-immune diseases (1%) from 2011 to 2017 and a decrease in the prevalence of neurological diseases (1%) among pregnant women with diabetes, changes in the trends were not significant (p>0.05).

After regression analysis adjusting for baseline characteristics, hypertension and endocrine diseases were shown to be significant risk factors for diabetes during pregnancy. The odds of diabetes during pregnancy in women with hypertension increased from 1.86 (95% CI=1.37-2.52) in 2011 to 1.90 (95% CI=1.43-2.53) in 2017. On the other hand, the odds of diabetes during pregnancy in women with endocrine diseases decreased from 1.67 (95% CI=1.32-2.12) in 2013 to 1.28 (95% CI=1.03-1.59) in 2017 (the odds for endocrine diseases were not significant in 2011 and 2012; p>0.05).

Conclusions: The prevalence of diabetes among pregnant women has increased from 2011 to 2017 and the odds are higher in women with endocrine diseases and hypertension during pregnancy.

116

Do dietitians recommend too much carbohydrate to women with gestational diabetes mellitus? A patient perspective

Laura C Kourloufas¹, **Robyn A Barnes**^{1,2}, **Lisa Robins**¹, **Tang Wong**^{1,3}, **Jeff R Flack**^{1,3,4}

1. *Diabetes Centre, Bankstown-Lidcombe Hospital, Bankstown, NSW, Australia*

2. *School of Health Sciences, Faculty of Health and Medicine, The University of Newcastle, Newcastle, NSW, Australia*

3. *Faculty of Medicine, University of NSW, Randwick, NSW, Australia*

4. *School of Medicine, Western Sydney University, Campbelltown, NSW, Australia*

Background: During the October 2017 joint Australasian Diabetes in Pregnancy Society and Society of Obstetric Medicine of Australia and New Zealand Conference, health care professionals reported that women with Gestational Diabetes Mellitus (GDM) often state that the quantity of carbohydrates in the Standardised Gestational Diabetes (SGD) diet is 'too much'. Our Diabetes Centre dietitians do not routinely experience this patient response in our multi-ethnic cohort.

Aim: To assess the patient perspective of the SGD diet, particularly in regards to carbohydrate amount and frequency.

Methods: An anonymous questionnaire was utilised to collect viewpoints from GDM women on the SGD diet. Pregnant women with pre-gestational diabetes, twins, non-English speakers and women with no or limited English literacy were excluded. Standard care was provided to all clients. The questionnaire was offered at least one week after an individual dietitian review appointment.

Results: Nineteen women have thus far been recruited. Responders represented seven ethnic backgrounds with the greater percentage South Asian (31.6%) and Middle Eastern (15.8%). Preliminary results show the majority of GDM women (84.2% n=16) perceived the SGD diet carbohydrate amount as 'about right'. Only 5.3% (n=1) perceived advised carbohydrate amounts as 'too much' or 'far too much'. Similarly, the majority of respondents (78.9% n=15) perceived recommended SGD diet eating frequency as 'about right'. In fact, a considerable proportion reported the carbohydrate amounts (63.2% n=12) and eating frequency (57.9% n=11) recommended by the dietitian as 'a little' or 'a lot less' compared to their usual intake. Commonly reported dietary changes included smaller meal portions (n=9), eating more often (n=6) and less carbohydrates or confectionary (n=6). The majority of grain-based carbohydrates were correctly identified, however milk (63.2% n=12) and fruit (73.7% n=14) were not recognised as carbohydrate-rich foods by many responders.

Conclusions: Preliminary findings suggest a trend for women to perceive the amount and frequency of carbohydrate within the SGD diet as 'about right'. Further recruitment to increase the sample size is ongoing.

Carbohydrate Restriction in Women with Gestational Diabetes at Fiona Stanley Hospital

Cathy Latino¹

1. Department of Dietetics, Fiona Stanley Hospital, Murdoch, WA, Australia

Aims

To measure the prevalence of CHO restriction, weight loss and ketone production in GDM women referred to Fiona Stanley Hospital Diabetes in Pregnancy (DIP) clinic for insulin initiation; to elucidate the reasons women restrict CHO and lose weight; to characterise the women who choose to restrict their CHO intake; and to measure the effectiveness of dietetic consultations in eliciting behaviour change that improves CHO intake and halts weight loss.

Method

All women referred to DIP clinic over a two month period were assessed for weight, BMI, diet history to establish current CHO intake, reason for CHO restriction if applicable, and non-fasting blood ketones. Individualised medical nutrition therapy was provided at this time.

Results

Of 102 women eligible for inclusion, 57% were restricting CHO intake below recommended levels, 38% had recent weight loss, 15% had non-fasting ketones of ≥ 0.3 mmol/L.

The main reason given for consuming inadequate CHO was to avoid insulin therapy (66%). After one dietetic intervention 95% of women who were initially restricting CHO improved their intake.

The average pre-pregnancy BMI of women restricting CHO was 31kg/m² versus 28kg/m² in the non-restricting group. Nearly half (48%) of women restricting CHO had weight loss or inadequate weight gain. Non-fasting ketones of ≥ 0.6 mmol/L were recorded in 7% of CHO restrictors compared with 2% of women consuming adequate CHO.

Of the women who lost weight, 70% were restricting CHO versus 48% of women who did not lose weight. After one Dietetic consultation 74% improved their weight status.

Conclusion

Carbohydrate restriction and weight loss are prevalent in GDM women referred for insulin initiation.

Women who restrict carbohydrate intake below recommended levels are more likely to lose weight and show evidence of ketonaemia.

Women who restrict CHO tend to have a higher pre-pregnancy BMI.

The most common reason for women to restrict their CHO intake is to avoid insulin therapy.

MNT is very effective in improving CHO intake and avoiding weight loss.

Ethnic inequities persist in screening for gestational diabetes in New Zealand despite implementation of national guidelines

Elizabeth Lewis¹, **Manjula Ratnaweera**¹, **Louise Wolmarans**¹, **Jade A U Tamatea**¹, **Ryan G Paul**¹

1. Waikato District Health Board, Hamilton

Background: Gestational diabetes mellitus (GDM) has important health implications for both the mother and child. Although Māori women are at greater risk of pre-existing diabetes or GDM during pregnancy than non-Māori women, screening rates for diabetes in pregnancy were lower in Māori women in 2013. To improve screening of GDM in all New Zealand women and to reduce this inequity, the Ministry of Health introduced national screening guidelines in 2014. Briefly, an HbA1c is recommended before 20-weeks gestation to detect undiagnosed diabetes (> 50 mmol/mol). If initial screening is negative, a 50 g oral polycose test (OPTT) or a 75 g oral glucose tolerance test (OGTT) is recommended at 24-28 weeks gestation.

Aims: To determine whether screening rates of GDM remain lower in Māori women than in non-Māori women in the Waikato region of New Zealand.

Method: Retrospective review of clinical records of all pregnant women with no known history of diabetes who delivered in the Waikato region from June - August 2017 (n = 807).

Results: Māori women (n = 259) were less likely than non-Māori women (n = 548) to have either an HbA1c performed before 20-weeks gestation (60.1% versus 68.0%; $P < 0.05$), or a screening OPTT or OGTT performed after 24-weeks gestation (64.8% versus 81.0%; $P < 0.001$). Screening at either time point was not affected by differences in age, social deprivation, or rural living. Only one woman (non-Māori) had pre-existing undiagnosed diabetes. The prevalence of GDM was unexpectedly lower in Māori women than in non-Māori women screened (3.9% versus 8.8%, $P < 0.05$).

Conclusion: Screening rates for GDM in both early and later pregnancy remain lower in Māori women than in non-Māori women, despite implementation of national guidelines. This inequity in screening likely explains, at least in part, why the prevalence of GDM in our study was lower in Māori women. Further work is required to achieve equity in screening for GDM in New Zealand.

Gestational Diabetes Mellitus in Singapore- Large for Gestational Age prevalence in different ethnic groups

Weivng Lim¹, Lay Kok Tan², Eng Loy Tan², Su-Yen Goh¹

1. *Endocrinology, Singapore General Hospital, Singapore*

2. *Department of Obstetrics and Gynaecology, Singapore General Hospital, Singapore*

Background

Singapore has a multi-ethnic population comprising mainly Chinese, Malay and Indian. In 2016, along with adoption of the IADPSG diagnostic criteria, our gestational diabetes mellitus (GDM) screening approach was changed from risk-based to universal. The GDM prevalence rate increased significantly following these changes.

Aim

This study aims to report differences in prevalence of large for gestational age babies between the various ethnic groups.

Method

This is a retrospective analysis of the biochemical and demographical data of all pregnant women who had an oral glucose tolerance test performed in the Department of Obstetrics and Gynaecology of Singapore General Hospital, between 1st January 2016 and 31st December 2016. Subjects with likely pre-existing diabetes mellitus are excluded.

Results

The overall prevalence of GDM was 17%. The GDM prevalence was highest in the Indian ethnic group (27%), followed by Malay (16%) and Chinese (13%) ethnic groups. There were no significant differences in the fasting, 1 hour and 2 hour plasma glucose levels between the ethnic groups. A third of Chinese women with GDM are above the age of 35, compared to only 9.8% in Indian women, and 18.3% in Malay women. There was no significant differences between the LGA prevalence between different ethnic groups.

Conclusion

The ethnic composition of the general Singapore population is 74% Chinese, 13% Malay, 9% Indians and 3% others. It is of significance that in a major tertiary centre in Singapore, the number of patients diagnosed with GDM in the major ethnic groups are roughly equal, representing a higher prevalence of GDM in individuals of non-Chinese ethnicity. There was no significant differences between the LGA prevalence between different ethnic groups.

Widening Disease definitions and changes in prevalence of GDM in Australia

Julia Lowe¹, Christiana Naaktgeboren², Jenny Doust³, Paul Glasziou³, Mariska Leeflang⁴

1. *University of Newcastle, Newcastle, NSW, Australia*

2. *University Medical Center, Utrecht, Holland*

3. *Centre for Research in Evidence-Based Practice (CREBP), Bond University, Labrador, QLD, Australia*

4. *Academic Medical Centre, University of Amsterdam, Amsterdam, Holland*

Aim: Evaluate considerations used when thresholds for diagnosis of gestational diabetes (GDM) were defined and the possible impact on rates of diagnosis of GDM in Australia.

Methods: A systematic search using a combination of synonyms for guidelines and GDM was performed in PubMed and National Guideline Clearinghouse to identify relevant guidelines published between January 1st, 2005 and January 1st, 2018. We evaluated whether (1) a clear description of the new definition (2) estimates on increased prevalence of disease, (3) triggers for modification of disease definition, (4) prognostic ability of the new definition to predict clinically important outcomes, (5&6) potential harms and benefits in the newly diagnosed, and (7) the balance of harms and benefits was included or considered. Rates of GDM were obtained from the NDSS Diabetes in Pregnancy Program and publications.

Results: Definitions used different conceptual bases: (i) a percentile (or Gaussian) definition, (ii) a risk-based assessment of different maternal and fetal outcomes, and (iii) harmonisation with type 2 diabetes in non-pregnant adults. A few influential studies were repeatedly cited, and no systematic reviews. The definition process did not include explicit consideration or quantification of benefits versus harms, and appeared to choose somewhat arbitrary cut points, such as the IADPSG consensus choice. Rates of GDM in Australia appear to have increased from less than 2% in 1990 to 13.7% in 2017. Possible causes are: Aging of the pregnant population, increasing weight, more screening, better recording of cases, changes in the rates of women from high risk ethnic groups and definition change. The sharpest increase was seen after adoption of changes to the ADIPS guidelines in 2013.

Discussion: Our analysis of the links and changes in definitions of gestational diabetes reveals a complex history. Differences in definitions may have led to substantial differences in the apparent prevalence of GDM

Introduction of a Diabetes in Pregnancy Programme in Guyana South America.

Julia Lowe¹, Brian Ostrow², Ruth Derkenne³, Natasha France³, Judy Hung³, Latchmi Nandalall³, Janie Pak³, Yaqueline Ricardo⁴

1. *University of Newcastle, Newcastle, NSW, Australia*

2. *Surgery, University of Toronto, Toronto, ON, Canada*

3. *Department of Obstetrics and Gynecology, , Georgetown Public Hospital Corporation (GPHC),, Georgetown, na, Guyana*

4. *Department of Medicine, Georgetown Public Hospital Corporation (GPHC),, Georgetown, na, Guyana*

Aim: One aim of the Guyana Diabetes Care Project was to introduce a protocol for the outpatient management of diabetes in pregnancy in Guyana.

Methods This was the outcome of collaboration between: The Banting and Best Diabetes Centre (BBDC) of the University of Toronto, the Ministry of Public Health (MOPH) of Guyana, and WONDOOR Global Health Program of the University Hospitals, Cleveland, Ohio. We developed an inter-professional team of clinical leaders and introduced a recognized method of universal screening for GDM at the national referral hospital in Georgetown (GPHC). A simplified outpatient management of hyperglycaemia in pregnancy was also pioneered using medical nutrition therapy followed by metformin then insulin monitored by self-monitoring of blood glucose with a 10point weekly profile, rather than automatic admission to hospital for monitoring and insulin treatment. Following the introduction of the programme at GPHC, it was introduced at 2 associated community health centres (HC).

Results

Between October 2016 and the end of April 2018, 2156 pregnant women were referred to GPHC. Twelve women were referred with Type 2 diabetes found before 24 weeks gestation. One thousand one hundred and sixty (54%) pregnant women between 24-37 weeks gestation were screened, 955 at GPHC and 205 at the HC. 294 women (25%) had positive 75gm OGT tests, 285 (30%) at GPHC and 9 (4%) at the HC.

Discussion

The high rate of positive tests 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, staff 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. Our results suggest universal screening may not be the only choice for low and middle income populations.

Comparing outcomes of pregnancy in women with diabetes with adequate pre-conception care against those without adequate endocrine follow-up.

Eanna Mac Gearailt¹, Peter Davoren¹, Jane Tellam¹, Kate Haigh¹

1. *Gold Coast Health, Southport, QLD, Australia*

Aims:

To identify whether there were any differences between the outcomes of pregnancy in women with pre-gestational diabetes that were under endocrine follow-up prior to pregnancy, compared to those who present whilst pregnant and without regular follow-up.

Methods:

We identified women with type 1 and type 2 diabetes who delivered over a two year period and were managed by the maternity services in a major tertiary hospital. We compared neonatal ICU admissions, neonatal hypoglycaemia, pre-term delivery, birthweight and large and small for gestational age neonates. Outcomes were compared for women known to our service and those who were regarded as not having received adequate pre-conception care.

Results:

30 pregnancies with in women with type 1 diabetes were identified. 12 pregnancies in women with type 2 diabetes were identified. No differences were identified in outcomes between the two groups although there was a tendency to pre-term delivery in those without adequate pre-conception care, with 62.5% of the Type 1 cohort not under active follow-up requiring pre-term delivery, compared to 35% of the Type 1 cohort without regular follow-up requiring pre-term delivery. Combining the type 1 & type 2 cohort showed 50% of those without adequate pre-conceptual follow-up required pre-term delivery, while 25% of those with adequate follow-up required pre-term delivery. (p = 0.10).

Conclusions

We did not demonstrate any differences in outcome for women with pre-gestational diabetes with or without 'adequate' pre-conception care. Small numbers may have had some impact on outcomes but birthweight and neonatal hypoglycaemia seemed comparable.

Cost-effectiveness of gestational diabetes screening including prevention of type 2 diabetes: application of the GeDiForCE model in Australia

Fan Yang¹, Brenda Gannon², David McIntyre^{3,4}

1. Centre for Health Economics, University of York, York, United Kingdom

2. Centre for the Business and Economics of Health, University of Queensland, St Lucia, Queensland, Australia

3. University of Queensland, South Brisbane, QLD, Australia

4. Mater Research, University of Queensland, South Brisbane, Queensland, Australia

Aims

Gestational diabetes mellitus (GDM) is associated with an increased risk of perinatal complications and higher risk of developing type 2 diabetes mellitus (T2DM). Screening and effective intervention for women with GDM could reduce these risks. This study aimed to assess the cost-effectiveness of the current ADIPS GDM strategy in Australia, including initial screening, antenatal care and postpartum lifestyle management intervention for women with GDM identified by the universal screening following the process and thresholds recommended by the International Association of Diabetes and Pregnancy Study Groups (IADPSG).

Methods

A decision tree model (GeDiForCE) was used in this study. Data on Australian GDM and T2DM epidemiology, intervention costs and literature were used to estimate model parameters. Costs (in Australian dollars \$), averted disability-adjusted life years (DALYs) and net cost per DALY averted during life-time horizon were calculated. Sensitivity analyses were also conducted by testing the impact of variations in intervention uptake rate and the effect of intervention in reducing lifetime maternal T2DM risk. No reduction in offspring diabetes risk was assumed.

Results

Compared with no GDM screening, the ADIPS GDM strategy could save money and avert DALYs. The lifetime cost of the ADIPS GDM strategy is \$17,384 per patient while no screening costs \$24,212. Average DALYs incurred per patient are 0.764 for the GDM strategy and 1.197 for the no screening, resulting in 0.561 DALYs averted using the strategy. Even after lowering the predicted uptake rate of intervention and lowering the estimated risk reduction of T2DM, the ADIPS GDM strategy is still cost-saving.

Conclusions

Using local data and literature estimates, this study shows that the use of ADIPS GDM universal screening and post-partum intervention would lead to cost saving care for pregnant women in Australia. Practical issues remain in terms of supporting women to continue with care, especially in the post-partum period.

Antenatal thyroid function and risk of gestational diabetes mellitus in a multi-ethnic pregnancy cohort

Christopher Muir¹, Shailja Tewari²

1. St. Vincent's Hospital, Sydney, Darlinghurst, NSW, Australia

2. Canterbury Hospital, Canterbury, NSW, Australia

Context: Antenatal hypothyroidism may be associated with an increased risk of developing gestational diabetes mellitus.

Objective: To evaluate whether a TSH value of greater than 2.50 mIU/L in early pregnancy increased the risk of developing gestational diabetes during that same pregnancy.

Design and Setting: Retrospective single centre cohort study of consecutive singleton pregnancies delivering in a multi-ethnic suburban area of Sydney, Australia.

Participants: All pregnant women who underwent antenatal thyroid and gestational diabetes screening and delivered in hospital over the 1 year period 01/01/2016 – 31/12/2016 (n = 1147). Women were grouped and compared by antenatal (first trimester) TSH values.

Main Outcome Measures: Incidence of gestational diabetes mellitus by thyroid status.

Results: Over one quarter of study participants (27.9%) developed gestational diabetes mellitus. Hypothyroidism of pregnancy was observed in 15.9% of women. In multivariable analyses, an antenatal TSH >2.50 mIU/L was not associated with increased risk of developing gestational diabetes mellitus [OR 0.74 (95%CI 0.48-1.16), $p=0.68$]. Traditional risk factors such as ethnicity, body mass index, past history of gestational diabetes mellitus and family history of type 2 diabetes were strongly predictive of developing gestational diabetes mellitus in the current pregnancy.

Conclusion: A TSH value of greater than 2.5 mIU/L in early pregnancy did not increase the risk of developing gestational diabetes mellitus.

Gestational Diabetes Mellitus in Tonga: Results from the first year of screening by the Tongan Gestational Diabetes Taskforce

Uchechukwu Levi Osuagwu¹, David Simmons¹, Maake Tupou², Falahola Fuka², Veisia Matoto³

1. School of Medicine, Diabetes, Obesity and Metabolism Translational Research Unit, Western Sydney University, Campbelltown, Campbelltown, South Western Sydney, NSW 2560, Australia

2. Department of Obstetrics and Gynecology, Vaiola Hospital, Nuku'alofa, Tonga

3. National Diabetes Centre, Vaiola Hospital, Nuku'alofa, Tonga

Background Diabetes and obesity are major public health problems in Tonga, predicting a substantial risk from hyperglycaemia in pregnancy (HIP) including gestational diabetes (GDM) and diabetes in pregnancy (DIP). Tonga provides free antenatal care which is attended by 98% of women. The Ministry of Health introduced systematic screening for GDM in 2016 across the main island of Tongatapu. We now describe the prevalence of GDM and DIP and associated GDM risk factors.

Methods Women who attended the antenatal services on Tongatapu between 1/1-31/12 2016 attended for a 75g oral glucose tolerance test (OGTT) at 24 weeks. Women with eg past GDM were referred for an early OGTT. DIP and GDM were diagnosed if fasting glucose (FBG) was ≥ 7.0 or 5.3-6.9 mmol/l respectively or 2 hour postprandial glucose was ≥ 11.1 or 9.0-11.0 mmol/l respectively. OGTTs were undertaken at Vaiola Hospital using one laboratory. Clinical data prospectively collected included age, GDM risk factors and body mass index (BMI: obesity cut off ≥ 32.0 kg/m²).

Results Overall, 1638 women attended, of whom 1625 (99.2%) completed the OGTT; mean age was 28 \pm 6 years and mean BMI 34.6 \pm 7.2; 63.7% were obese. 8.4% had GDM and 2.1% DIP. The prevalence of GDM/DIP increased significantly ($p < 0.001$) with age (<25 years, 25-29.9 years, 30-34.9 years, 35+ years: 3.4%, 5.9%, 13.5%, 13.6%/0.8%, 0.7%, 3.3%, 4.6% respectively). The prevalence of GDM/DIP increased significantly with BMI (3.4%, 5.7%, 9.7%, 13.4%/0.7%, 1.5%, 2.6%, 1.9%, $p < 0.001$), past GDM (21.9% vs 10.%, $p < 0.05$) and family history of diabetes (16.5% vs 7.3%, $p < 0.001$). After adjustments, the prevalence of HIP increased significantly with family history (OR 2.37; 95%CI:1.64-3.42) and age [1.48(0.78-2.81), 3.69(2.05-6.63), 4.97(2.72-9.08), respectively] but not BMI or past GDM. Isolated high FBG, 2HbG and both FBG/2HbG were present in 6.8%, 0.7% and 2.9% women respectively.

Conclusion. A high proportion of Tongan women with HIP have DIP and particularly fasting hyperglycemia. Age appears to be a more important risk factor than obesity in this population.

Analysis of risk factors for the early and late diagnosis of gestational diabetes: Which women should be tested early?

Amanda Quattrocelli¹, Arzoo Khalid¹

1. Northern Health, Epping, VIC, Australia

Aim:

To determine which risk factors are the strongest predictors of earlier diagnosis of gestational diabetes in women birthing at The Northern Hospital and how they compare to those recommended by the Australasian Diabetes in Pregnancy Society (ADIPS) for early glucose tolerance testing.

Methods:

Women with GDM who gave birth at the Northern Hospital between 01/07/2017 and 31/10/2017 were studied retrospectively. Each patients' risk factors for GDM as outlined by ADIPS were recorded and compared according to the timing of glucose tolerance test, being less than 24 weeks or 26-28 weeks gestation. Chi squared analysis and odds ratios were used to compare GDM risk factors between women who were diagnosed with GDM prior to 24 weeks gestation and those with diagnosis later.

Results:

Of 1298 births, 243 women (18.7%) were diagnosed with GDM. Multiparous women with previous GDM and women with a familial history of diabetes were 2.4 and 2.3 times more likely to have an early GDM diagnosis compared to women without previous or familial diabetes respectively ($p < 0.01$). The more risk factors a woman had, the more likely an early GDM diagnosis was made. When analysing risk factors recommended by ADIPS including previous macrosomia, high pre-pregnancy BMI, ethnicity, advanced maternal age, polycystic ovarian syndrome or the use of antipsychotic medications in pregnancy there was no difference between early (<24 weeks) and late (>24 weeks) GDM diagnosis. The mean number of risk factors for women with an early versus late diagnosis of GDM were 3.6 and 2.0 respectively.

Conclusion:

A history of previous GDM or familial history of diabetes is the strongest predictor for an early diagnosis of diabetes in pregnancy. There is a cumulative effect of risk factors when assessing the overall GDM risk of pregnant women. There was no difference between early and late diagnosis of GDM for women with other risk factors outlined by ADIPS in this patient population.

Breastfeeding intentions during pregnancy predict breastfeeding at 3 months post-birth among women with pre-existing diabetes in Victoria

Bodil Rasmussen¹, Alison Nankervis², Helen Skouteris³, Catharine McNamara⁴, Cheryl Steele⁵, Lauren Bruce³, Sara Houlton¹, Karen Wynter¹

1. Centre for Patient Safety and Quality Research, Deakin University-Western Health, Geelong, VIC, Australia

2. Department of Diabetes and Endocrinology, Royal Melbourne Hospital, Melbourne, Victoria, Australia

3. Monash Centre for Health Research & Implementation, Faculty of Medicine, Nursing and Health Sciences, School of Public Health & Preventive Medicine, Melbourne, Victoria, Australia, Melbourne, VIC, Australia

4. Diabetes Education, Mercy Hospital for Women, 163 Studley Road, Heidelberg, Vic, 3084, Melbourne, Victoria, Australia

5. Diabetes Education Area, Sunshine Hospital, Furlong Road, St Albans, 3021 Vic, Melbourne, Victoria, Australia

Aims

Breastfeeding among women with pre-existing diabetes is particularly important because it optimises neonatal outcomes. This study aimed to identify physical, social, psychological and cultural facilitators/barriers to the continuation of breastfeeding to 3 months post-birth among women with type 1 (T1DM) and type 2 (T2DM) diabetes.

Methods

Pregnant women were recruited from antenatal clinics at three health metropolitan services in Victoria. Data were collected via telephone interviews when the women were 30-34 weeks pregnant (demographic and reproductive factors, and women's intention to breastfeed) and at 3 months post-birth (current breastfeeding, social and professional support).

Results

Of the 102 pregnant women who were invited to participate, 79 (77.5%) women with either T1DM (51%) or T2DM (49%) participated in the study during pregnancy. Of these, 47 (59.5%) also completed telephone surveys at 3 months postpartum. At this point, 68.2% of women were still breastfeeding (exclusive or any). Controlling for other relevant variables, only intention to breastfeed to at least 3 months (assessed during pregnancy) was significantly associated with breastfeeding at 3 months (Adjusted Odds Ratio=20.490, 95% Confidence Intervals 20.182–20.802, $p=0.017$).

Conclusions

Intention to breastfeed is a known predictor of breastfeeding among women in general; these findings demonstrate that among women with T1DM and T2DM the importance of intention to breastfeed outweighs other potential predictors of breastfeeding at 3 months post-birth. These include health-related factors and the extent to which women feel supported by their health professionals, family and friends. These findings have implications for health care providers caring for women with T1DM and T2DM during pregnancy, given their potential to influence women's intention for future breastfeeding. Integrating these findings into clinical practice will ensure the breastfeeding intentions of women with T1DM and T2DM are supported.

Rethinking Food Group recommendations in Pregnancy to help prevent excessive Weight Gain and Gestational Diabetes Mellitus

Anita M Star¹, Leah E Vandervliet

1. Dr Anita Star- Nutrition Consultant, Glenroy, NSW, Australia

Aim: To develop new food group recommendations for pregnant women. Taking into account new evidence that supports the prevention of excessive pregnancy weight gain and Gestational Diabetes Mellitus (GDM).

Method: We examined the literature on eating patterns and pregnancy outcomes to identify how the current NHMRC 'Eat for Health' Pregnancy food group recommendations and the Ministry for Health New Zealand 'Eating for Healthy Pregnant Women' food group guidelines compare. We then remodelled the food group recommendations to incorporate this new information.

Results: Since the national guidelines were published, there has been a leap in research studying eating patterns in pregnancy outcomes including gestational diabetes mellitus. This includes positive results for the Mediterranean style eating pattern, The Nordic style eating pattern, DASH diet and fish intake, and further information about the detriments of high sugar, high trans-fat processed foods and processed meats. In remodelling the food group recommendations we have come up with separate guidelines for the first and later trimesters taking into account changing nutritional needs over the course of pregnancy and provided specific information to include healthy fats, fish, greater intake of plant proteins, in addition to the other core food groups.

Conclusion: We have remodelled pregnancy food group recommendations to meet women's needs. These also incorporate the current research on eating patterns that have been found to decrease excessive weight gain in pregnancy and rates of GDM.

A retrospective audit on the neonatal outcomes of women with gestational diabetes mellitus post implementation of the Diabetes Antenatal Care and Education (DANCE) Clinic in a busy tertiary hospital in Northern Adelaide, South Australia

Wuen Lynn Toh, Abner JY Quek¹, Peak Mann Mah², Anjana Radhakutty², Simon Kane^{3,1}, Gustaaf Dekker^{3,1}

1. University of Adelaide, Adelaide, South Australia, Australia

2. Endocrinology, Lyell McEwin Hospital, Adelaide, South Australia, Australia

3. Obstetrics & Gynaecology, Lyell McEwin Hospital, Adelaide, South Australia, Australia

Introduction:

Gestational diabetes mellitus (GDM) is associated with increased maternal and neonatal morbidity. The Diabetes Antenatal Care and Education (DANCE) clinic, an interdisciplinary service including obstetricians, endocrinologists, dieticians and diabetic educators was established in The Lyell McEwin Hospital, South Australia in 2012 to provide integrated care for GDM patients.

Objective:

To compare neonatal outcomes in women with GDM on pharmacological intervention before and after the introduction of DANCE clinic.

Methods:

A retrospective audit was performed on pregnant women who were diagnosed with GDM over a 12-month period in 2005 and in 2015 at the Lyell McEwin Hospital (LMH) and received pharmacological treatment (Insulin and/or Metformin). Patient's demographics, treatment types, medication doses and foetal outcomes were noted. Fisher's exact test was used to calculate the significance in results.

Results:

In 2005, 163 patients were diagnosed with GDM, and 39 (23.9%) required medication for their GDM management. Of the 39 pregnancies, there were 41 babies born. In 2015, 207 patients were diagnosed with GDM, and 95 (45.9%) patients required medications for GDM management. Of the 95 pregnancies, there were 96 babies born.

There was a statistically significant reduction in neonates requiring special care nursery (SCN) in 2015 post implementation of DANCE clinic (68.3% in 2005 vs 44.7% in 2015, $p=0.0093$).

There was a significant decrease in the rates of neonatal hypoglycaemia as well in 2015 (46.3% in 2005 vs 28.8% in 2015, $p=0.0384$).

There was however, no significant difference in the number of neonates with hypoglycaemia requiring dextrose infusion (31.6% in 2005 vs 39.3% in 2015, $p=0.4113$).

No significant difference in the rates of jaundice, infection, respiratory distress and foetal death were noted in 2015 compared to 2005.

Conclusion:

The implementation of an integrated multidisciplinary antenatal care for women with GDM was associated with a reduction in neonatal hypoglycaemia and neonates requiring SCN.

Improving service delivery to enhance care for women with gestational diabetes at Palmerston North Hospital New Zealand – a retrospective audit

Kristen White¹, Amanda de Hoop¹, Kerrie Skeggs¹, Veronica Crawford¹

1. Midcentral District Health Board - Palmerston North Hospital, Palmerston North, MANAWATU, New Zealand

Aims: To provide quality care to growing numbers of women with gestational diabetes mellitus (GDM) within a resource-limited diabetes service, a new initiative was developed in January 2018 to support increased face-to-face time with diabetes health professionals while women attend their appointments at High Risk Antenatal Clinic (HR-ANC). Prior to 2018 women had regular reviews with the obstetrics team at HR-ANC and saw the diabetes team (endocrinologist, diabetes nurse specialist and diabetes specialist dietitian) as needed. The retrospective audit was performed to determine whether adding a second diabetes team, diabetes specialist nurse and diabetes specialist dietitian, to the HR-ANC improved the opportunities for increased patient interaction time.

Methods: An audit was conducted to assess the in-person contact time women had with diabetes professionals in 2017 compared to 2018. The medical notes of 40 women, 20 each year, were reviewed to calculate the number of face-to-face interactions women had and topics discussed with diabetes team members. Other modalities of contact were excluded.

Results: In 2017 women had an average of 2.3 in-person interactions with diabetes team members during pregnancy. Post implementation, women were seen an average of 3.3 times, a 30% increase from 2017. Topics discussed in 2017 included nutritional management of GDM, weight gain targets and diabetes medication initiation/adjustment. Additional topics addressed in 2018 included micronutrient adequacy, type 2 diabetes risk reduction, postnatal delivery plans and postnatal service referrals.

Conclusions. A second stream of diabetes specialist team members present at weekly HR-ANCs significantly increased the opportunity for diabetes health professionals to have face-to-face interactions with women with GDM, foster discussions about a broader range of relevant health topics, and share more information about future diabetes risk reduction.

134

Facilitating best practice service changes: experiences of implementing a model of gestational diabetes mellitus care in dietetics

Shelley A Wilkinson^{1,2}, Maxine O'Brien³, Sally J McCray⁴, Desley Harvey⁵

1. Mater Mothers' Hospital/Mater Medical Research Institute, South Brisbane, Qld, Australia

2. Dietetics and Foodservices, Mater Health, Brisbane, Queensland, Australia

3. Allied Health Acting Research Fellow & Alcohol and Other Drugs Services, Darling Downs Hospital and Health Service, Toowoomba, Queensland, Australia

4. Director, Dietetics and Foodservices, Mater Health, Brisbane, Queensland, Australia

5. Health Practitioner Principal Research Fellow & College of Healthcare Sciences, Cairns and Hinterland Hospital & Health Service and James Cook University, Cairns, Queensland, Australia

Aims: Translating research into clinical practice is a challenge for health services. Emerging approaches in implementation science recognise the need for a theory-driven approach to identify and overcome barriers to guideline adherence. However, many clinicians do not have the capacity, confidence, or expertise to realise change in their local settings. Recently, two regional sites participated in a facilitated implementation project of an evidence-based model of GDM care in dietetics, supported by a team at a metropolitan centre. This study describes (i) stakeholder experiences', and (ii) learnings to inform implementation of the model of care (MOC) across Queensland.

Methods: This qualitative study utilised semi-structured interviews. A purposive sample of practitioners was recruited from 'core' project members, including the GDM dietitian, self-nominated site project champion, dietetics project lead, plus key stakeholders. Eight participants were recruited; five from one site. Interviews explored project experiences from commencement to completion, barriers and enablers to project implementation, strategies to overcome challenges and recommendations for implementation at other sites. Interviews were recorded and transcribed. Two researchers independently coded, sorted, and synthesized all transcripts to derive themes which were shared with other investigators and agreed by discussion and consensus.

Results: Four main themes were derived: (1) catalyst for positive change, (2) managing project logistics, (3) overcoming barriers, and (4) achieving change.

Conclusion: The findings suggest that a model of facilitated implementation using an evidence-based decision making tool is an effective method of fostering health service change and is acceptable to staff. In addition to methodological expertise, key elements of the facilitation should include building confidence and capacity of local implementers through regular contact, encouraging local networking, linking to higher management support and assessing and/or influencing workplace or organisational culture. However, the balance between delivering clinical care while participating in a service change project proved challenging to many participants.

136

Smartphone App linking glucose data: is it a safe and effective way of managing women with gestational diabetes?

Jenny MS Wright¹, Sarah Dr Chalak², Elvin Mr Garcia¹, Alma MS Parker¹, Bronwyn MS EVERETT³, Claudia MS Lopez¹, Vincent A/Prof Wong⁴

1. Fairfield Hospital, Prairiewood, NSW, Australia

2. Clinical Genetics Department technically, Liverpool Health Service, Sydney, NSW 2170, Australia

3. School of Nursing and Midwifery | Centre for Applied Nursing Research, Western Sydney University, Sydney, NSW, Australia

4. Diabetes & Endocrine Service, Liverpool Hospital, Liverpool, NSW, Australia

Background: Good glycaemic control in women with gestational diabetes mellitus (GDM) improves pregnancy outcomes. Current standard of care involves frequent (1-2 weekly) diabetes clinic review. Since 2016, implementation of the new World Health Organisation diagnostic criteria has resulted in 23–25% increase in prevalence of GDM at our institution, with substantial burden on our resources.

A new model-of-care (MOC) using smartphone meters and linking data with the diabetes team was piloted in April 2017. English speaking women with a compatible smartphone were invited to participate. Blood glucose levels (BGLs) were reviewed weekly on internet portal. The women had 4 weekly clinic reviews at antenatal clinic until 36 weeks' gestation and then weekly until delivery. If BGLs were unacceptable on the portal, women were seen in clinic earlier.

Aim: To evaluate the safety and effectiveness of this MOC and whether it leads to reduction of clinic visits.

Method: The intervention group consisted of women who participated in the pilot study (April 2017– December 2017) while the control group included women with GDM who attended antenatal clinic between October 2016 and March 2017. We conducted an audit retrospectively on background characteristics, pregnancy outcomes and number of diabetes-related clinic visits for both groups.

Findings:

There were 272 women in control group and 163 in intervention group. No difference in background characteristics was found between the 2 groups except a greater need for interpreters in the control group (43.2 vs 6.5%, $p < 0.001$). The number of clinic appointments was significantly fewer in the intervention group (6.4 ± 2.9 vs 7.3 ± 3.6 visits, $p = 0.009$). After excluding women requiring interpreters, those in the intervention group still had fewer clinic appointments (6.3 ± 2.9 vs 7.1 ± 3.6 visits, $p = 0.038$). No difference in pregnancy outcomes, including mode of delivery, admission to special care nursery, birthweight and neonatal hypoglycaemia, between the two groups was observed ($p > 0.05$).

Conclusions:

Our study found that this new MOC was safe and the women required fewer diabetes-related clinic visits during pregnancy.

1. Australian carbohydrate intolerance study in pregnant women: implications for the management of gestational diabetes. <https://www.ncbi.nlm.nih.gov/pubmed/16401212> 2. http://apps.who.int/iris/bitstream/handle/10665/85975/WHO_NMH_MND_13.2_eng.pdf;jsessionid=CC842F2A75C02EAAD4F887930C5D1177?sequence=1

137

The Worldwide Prevalence of Gestational Diabetes

Lili Yuen¹, David Simmons¹

1. Western Sydney University, Campbelltown, NSW, Australia

Introduction: A large and growing number of studies have focused on the increasing prevalence of gestational diabetes mellitus (GDM). We conducted a systematic review of the epidemiology of GDM and its prevalence with emphasis on the changes since the introduction of the International Association of Diabetes and Pregnancy Study Groups (IADPSG) ¹ screening and diagnostic guidelines, endorsed by the World Health Organization². This recommends a one-step 75g oral glucose tolerance test performed at 24-28 weeks, where GDM is diagnosed when any of the following plasma glucose cut-offs are met – fasting ≥ 5.1 mmol/L, 1-h ≥ 10.0 mmol/L, or 2-h ≥ 8.5 mmol/L.

Method: Studies reporting the prevalence of GD were identified using PubMed, Scopus and Embase databases. Studies reporting on a countries' GD prevalence or incidence data with a sample size greater than 1520 were deemed to be representative of that countries' population and included in the review. Studies were also excluded if they were not published in English, or not original articles.

Results: 278 studies were identified that met the inclusion criteria since 1980, most being published in the North America, Europe and Asia-Pacific region. Prevalence rates varied greatly between regions – ranging from 3-19.5% in Africa; 2.3-19.9% in East/South-East Asia; 0.2-28.5% in Europe; 10 -24.2% in the Middle East; 1.8-19.2% in North America; 3.4-29.6% in Oceania; 13.4-35% in South Asia. There was heterogeneity within the regions in terms of ethnicities, screening and diagnostic practices which likely account for the variation.

Other factors accounting for the differences include increasing rates of obesity and maternal age. There has also been a marked rise after the year 2010 with the widespread adoption of the diagnostic criteria recommended by the IADPSG with some prevalence rates reported as rising by over two-fold, particularly in East and South Asian and Middle Eastern countries.

Conclusion: The worldwide prevalence of GDM is steadily increasing, with a particularly sharp increase in prevalence occurring over the last decade since the adoption of IADPSG screening and diagnostic criterion.

1. International Association of Diabetes and Pregnancy Study Groups Consensus Panel. International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. *Diabetes care* 2010;33:676-82.
2. World Health Organization. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy Geneva, Switzerland: WHO Press; 2013 [Available from: http://apps.who.int/iris/bitstream/handle/10665/85975/WHO_NMH_MND_13.2_eng.pdf;jsessionid=3B8B5B76DBEFE500A7A64CCF90D2035D?sequence=1]

138

Assessing the impact of dietetic intervention in women with gestational diabetes mellitus

Julia Zinga¹, Paige van der Pligt², Claire Margerison², Gina Absalom²

1. Royal Women's Hospital, Parkville, VIC, Australia

2. School of Exercise and Nutrition Science, Deakin University, Burwood, VIC, Australia

Aims: Dietitians play a pivotal role in gestational diabetes mellitus (GDM) management, yet limited literature has assessed the impact of dietetic intervention in women with GDM. The aim of this study was to assess the associations between dietetic intervention and aspects of patient care in women diagnosed with GDM, and a range of maternal and neonatal outcomes.

ADIPS ASM 2018 – ORAL AND POSTER ABSTRACTS

Methods: This was a retrospective cohort study, of 1233 adult women diagnosed with GDM in a singleton pregnancy, who delivered at The Royal Women's Hospital (RWH), between 1 July 2015 and 31 May 2017. A medical records audit determined the number of dietetic consultations per patient and obtained information regarding patient care (medical nutrition therapy or added pharmacotherapy, specialist diabetes clinic care or routine antenatal care), maternal outcomes (delivery method and birth interventions), and a range of neonatal outcomes. Adjusted linear and logistic regression was used to analyse associations.

Results: Women who required pharmacotherapy had a greater number of dietetic consultations compared to women managed solely with medical nutrition therapy (β -coef (95%CI) =0.28(0.17-0.39)), ($p<0.001$). Women managed in the specialist diabetes clinic had a greater number of dietetic consultations compared to women who were managed in routine antenatal care (β -coef (95%CI) =0.50(0.36-0.63)), ($P<0.001$). Women who received 1 or more dietetic consultations had a decreased likelihood of infant admission to the neonatal intensive care unit (NICU) or special care nursery (SCN) ([OR] 0.41, 95% CI 0.22-0.75; $P=0.004$), compared to women who did not receive any dietetic intervention. There were no associations between number of dietetic consultations and maternal outcomes (delivery method and birth interventions) or other neonatal health outcomes.

Conclusions: Dietetic intervention in GDM, as part of a comprehensive package of healthcare, is associated with fewer infant admissions to NICU or SCN. Further research should assess the impact of dietetic intervention, on optimising maternal and neonatal health in women with GDM.