INDEX

WELCOME

It is with great pleasure, on behalf of ADIPS and the local organising committee, that we welcome you to Adelaide for our 2015 Annual Scientific Meeting. After many years of debate over the guidelines for the diagnosis of gestational diabetes, we have tried to focus on the issues of type 1 and type 2 diabetes in this conference. However, we don't resile from ongoing debate, and highlight the issue of abnormal glucose testing in early pregnancy, and what it means. We hope you enjoy the scientific content of the meeting, and have your clinical practice challenged. We also hope you have the opportunity to catch up with old friends, and find new ones.

Best wishes
Leonie Callaway
President of ADIPS

On behalf of The Australasian Diabetes in Pregnancy Society and the Local Organising Committee we warmly welcome you to our beautiful city of Adelaide for the 2015 Annual Scientific Meeting. The conference this year will focus on the main themes of obesity in pregnancy, pregnancy in women with pre-existing diabetes and pregnancy in aboriginal mothers while also providing an update on the ADIPS gestational diabetes guidelines. The program promises to be exciting with various formats of presentation aimed at encouraging audience participation. We are confident this will enrich your clinical work among mothers with diabetes.
Over the next three days we look forward to meeting you and hope that you will be able to join us in the social events planned around the conference, including dinner at the CitiZen restaurant.
Best wishes,
Shantha Joseph
Chair, Local Organising Committee

ORGANISING COMMITTEE

Chair:

Dr Shantha Joseph - Flinders Medical Centre, SA

Dr Jui Ho - Flinders Medical Centre, SA

Jillian Lyon-Green RN, CDE - Lyell McEwin Hospital,SA

Linda Burcher RN, CDE - Flinders Medical Centre, SA

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CONFERENCE SECRETARIAT
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ASN Events Pty Ltd
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Balnarring Vic 3926, Australia
Phone: +61 (0)3 8692 2037
Fax: +61 (0)3 5983 2223
Email: bd@asnevents.net.au

CONFERENCE WEBSITE:

www.adipsasm.org

SOCIETY WEBSITE:

www.adips.org

SPONSORS

Thank you to the ADIPS Annual Scientific Meeting 2015 sponsors for their continued support.

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MAJOR SPONSOR

SPONSORS

DELEGATE INFORMATION

VENUE
Adelaide Convention Centre
North Terrace
Adelaide, South Australia 5000
Phone: 08 8212 4099

REGISTRATION DESK – ASN EVENTS
The registration desk for ADIPS will be located in the City Rooms Foyer and will be open:

- Friday 28th August from 7:30 am to 3:00 pm
- Saturday 29th August from 8:00 am to 5:30 pm
- Sunday 30th August from 8:00 am to 1:00 pm

WHAT YOUR REGISTRATION INCLUDES
Full Conference and Allied Health/Student registrations include:

- Access to sessions of your choice for nominated days of attendance
- Morning tea, lunch and afternoon tea on days of nominated attendance
- Conference satchel including conference material
- Delegate abstract proceedings
- GST

CONFERENCE DINNER
This year's conference dinner will be held at **Citi Zen, Adelaide**
When: Saturday 29th August
Time: 7:00pm onwards
Address: 401 King William Street, Adelaide
Dress Code: Smart Casual
*If you haven't indicated that you would like a ticket, please visit the registration desk and ask about availability.

Citi Zen is situated at 401 King William Street in Adelaide CBD , Citi Zen Restaurant is confined behind the old Brecknock Hotel walls. The building is known as one of the most historical buildings in Adelaide, over a century old. After a major interior renovation in September 2011, the building is now hosting the largest capacity Chinese restaurant in South Australia.

Getting to the restaurant
Short Taxi ride from the Convention Centre

Free Tram
From the Adelaide Railway station tram stop – take the tram to Glenelg and disembark at the City South Tram Stop. Citi Zen is on the right hand side of the road.

Walking 20 minutes approximately 2.4 km

SPEAKER PREPARATION
Presentations are to be loaded direct to the PC in the presentation room **at least** a full session in advance of your session. You should bring your talk on a USB, saved in a format for display on a PC within the meeting room. A technician will be on hand to assist with any transfer / loading issues and to help you check your presentation.

DISPLAYING YOUR POSTER

Posters can be displayed from lunchtime on Friday 28th August. They will need to be removed by the end of morning tea on Sunday 30th August.

Please locate your abstract number in this handbook for correct positioning on the panels. The maximum size allowed is 1 m wide by 1.2 m high. The approved method for attaching your poster is with Velcro. Please visit the registration desk for supplies.

INTERNET ACCESS

There is complimentary wireless throughout the conference centre. Login details will be provided at the registration desk.

MOBILE PHONES

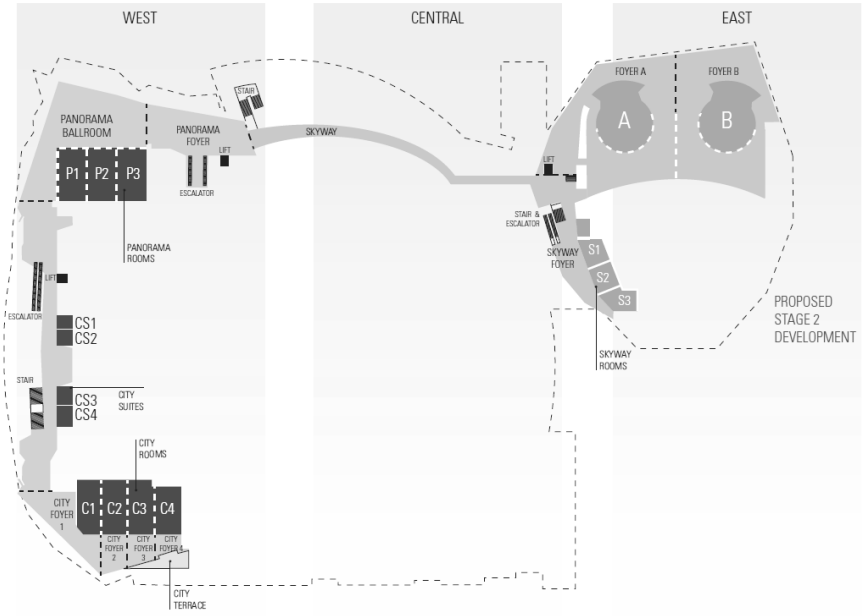
Please ensure your mobile phone is on silent during any session you attend.
The meeting this year will have a free Smartphone/Mobile Device 'App' that will allow you to view the abstracts and program on your phone, iPad or laptop in a simple and easy to read format. To access the 'App', please open the link http://adips-2015.m.asnevents.com.au through the internet on your phone, iPad or laptop. You will be prompted to add an icon onto your device desktop.

INSURANCE

The hosts and organisers are not responsible for personal accidents, travel costs, or the loss of private property and will not be liable for any claims. Delegates requiring insurance should make their own arrangements.

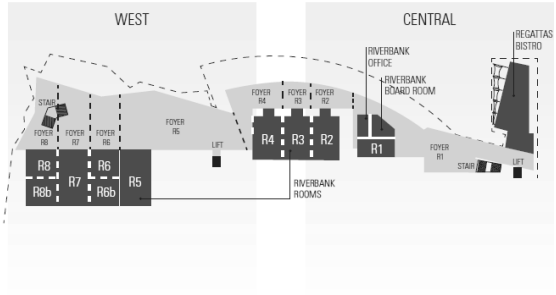
VENUE MAP

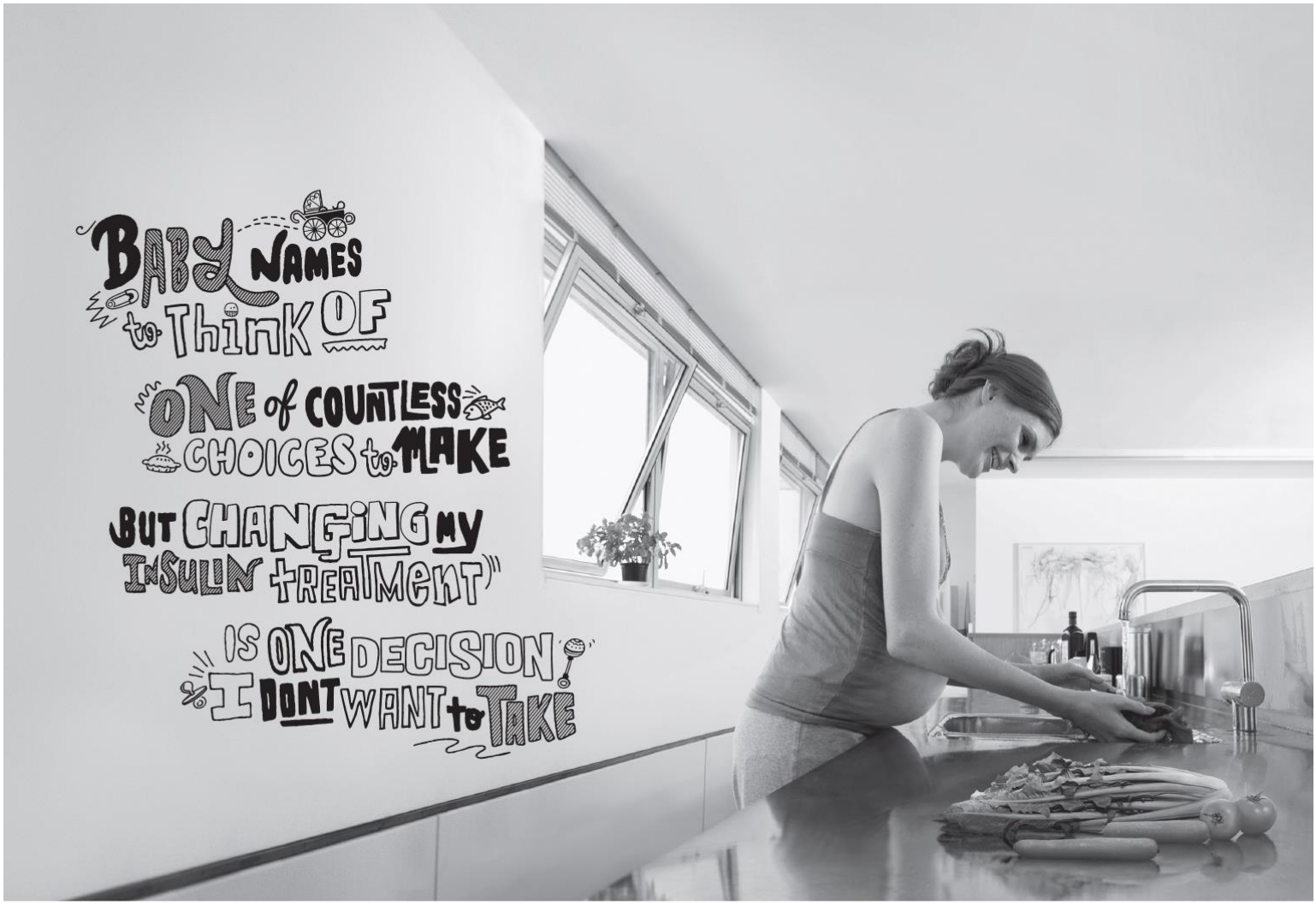
UPPER LEVEL



GROUND LEVEL

LOWER LEVEL





Levemir® insulin detemir (rys)

NovoRapid® insulin aspart (rys)

My type of treatment[1,2]

PBS information: NovoRapid® is listed on the PBS as a drug for the treatment of diabetes mellitus. Levemir® is listed as a restricted benefit for type 1 diabetes.

Levemir® is indicated for once- and twice-daily use in type 1 and type 2 diabetes[1]

Before prescribing, please review Product Information available from Novo Nordisk. For the most up-to-date Product Information, call 1800 668 626.

Levemir® (insulin detemir (rys)). Indication: Treatment of diabetes mellitus. **Contraindications:** Hypersensitivity to insulin detemir or excipients. **Precautions:** Inadequate dosing may lead to hyperglycaemia and DKA. Hypoglycaemia may occur if dose too high in relation to requirements (see full PI). For subcutaneous administration only. Avoid I.M. administration. I.V. administration may result in a severe hypo. Mixed with other insulins the action profile of either or both may change. Do not use in infusion pumps. Do not add to infusion fluids. When thiazolidinediones (TZDs) are used in combination with insulin, patients should be observed for signs and symptoms of congestive heart failure, weight gain and oedema; discontinuation of TZDs may be required. No clinical experience during lactation. *Children:* Levemir can be used in children. Clinical trial experience is available in children with type 1 diabetes aged 2 years and over (see 'Clinical Trials' in full PI). *Pregnancy:* Category A. Levemir can be considered during pregnancy. Clinical trial experience is available in pregnant women with type 1 diabetes (see 'Clinical Trials' in full PI). **Interactions:** Oral antidiabetic drugs (OADs), octreotide, lanreotide, monoamine oxidase inhibitors, nonselective beta-adrenergic blocking agents, angiotensin converting enzyme inhibitors, salicylates, alcohol, anabolic steroids, alpha-adrenergic blocking agents, quinine, quinidine, sulphonamides, oral contraceptives, thiazides, glucocorticoids, thyroid hormones, sympathomimetics, growth hormone, diazoxide, asparaginase, nicotinic acid, oxymetholone and danazol. Studies do not suggest clinically relevant albumin binding interactions between insulin detemir and fatty acids or other protein-bound drugs. **Adverse Effects:** Hypoglycaemia, injection site reaction. **Dosage and Administration:** For type 1 diabetes, use in combination with rapid- or short-acting insulin. For type 2 diabetes, use alone or in combination with bolus insulin, OADs, or as add-on therapy to liraglutide. Administer once- or twice-daily as part of a basal-bolus regimen, depending on needs. Adjust dose individually. In combination with OADs or as add on therapy to liraglutide, where optimisation of blood glucose control is not achieved with once daily injection, consideration should be given to adding a mealtime bolus injection of short-/rapid-acting insulin, or to transferring the patient to a pre-mixed insulin (October 2013). **NovoRapid® (insulin aspart (rys)). Indication:** Treatment of diabetes mellitus. **Contraindications:** Hypoglycaemia. Hypersensitivity to insulin aspart or excipients. **Precautions:** Inadequate dosing or discontinuation of treatment may lead to hyperglycaemia and diabetic ketoacidosis. Where blood glucose is greatly improved, e.g. by intensified insulin therapy, patients may experience a change in usual warning symptoms of hypoglycaemia, and should be advised accordingly. The impact of the rapid onset of action should be considered in patients where a delayed absorption of food might be expected. When thiazolidinediones (TZDs) are used in combination with insulin, patients should be observed for signs and symptoms of congestive heart failure, weight gain and oedema; discontinuation of TZDs may be required. *Insulin administration may cause insulin antibodies to form and, in rare cases, may necessitate adjustment of the insulin dose. *Pregnancy:* Category A. Insulin aspart can be used in pregnancy (see 'Clinical Trials' in full PI). *Children:* NovoRapid® can be used in children. Clinical experience is available in children aged 2 years and over (see 'Clinical Trials' in full PI). *Elderly:* No safety issues were raised in elderly patients with type 2 diabetes (mean age 70 years) in a PK/PD trial but careful glucose monitoring may be necessary in elderly patients (see 'Clinical Trials' in full PI). **Interactions:** Oral hypoglycaemic agents, octreotide, lanreotide,monoamine oxidase inhibitors, non-selective, beta-adrenergic blocking agents, angiotensin converting enzyme (ACE) inhibitors, salicylates, alcohol, anabolic steroids, alpha-adrenergic blocking agents, quinine, quinidine, sulphonamides, oral contraceptives, thiazides, glucocorticoids, thyroid hormones, sympathomimetics, growth hormone, diazoxide, asparaginase, nicotinic acid. **Adverse Effects:** Hypoglycaemia. **Dosage and Administration:** Dosage as determined by physician. NovoRapid® should be administered immediately before a meal, or when necessary after the start of a meal. Discard the needle after each injection. NovoRapid® can be used subcutaneously, intravenously or (10mL vial only) via continuous subcutaneous insulin infusion ('CSII'). (July 2014). **References:** 1. Levemir® Approved Product Information (Oct 2013). 2. NovoRapid® Approved Product Information (July 2014). Novo Nordisk Pharmaceuticals Pty Ltd. ABN 40 002 879 996. Level 3, 21 Solent Circuit, Baulkham Hills, NSW 2153. NovoCare® Customer Care Centre (Australia) 1800 668 626. www.novonordisk.com.au. ® Registered trademark of Novo Nordisk A/S. NODI9675/BW/P. March 2015. Ward6.

novo nordisk®

*Please note changes to the Product Information

INVITED SPEAKERS

International Invited Speaker

Professor Linda Barbour

Lynn Barbour is a Professor in Endocrinology, Metabolism and Diabetes with a joint appointment in the Department of Obstetrics and Gynecology with special expertise and research interests in metabolic diseases in pregnancy and a member of the CCTSI Child and Maternal Health Advisory Board. She has a Master's of Science in Public Health and chaired the Guidelines on the Management of Gestational Diabetes (GDM) for the state of Colorado. She is also the new Chair for the ADA Scientific Advisory Planning Committee for Pregnancy and Reproductive Health. Her research interests and expertise are in maternal metabolism, particularly obesity and GDM. She has developed a strong national reputation in the field of maternal obesity and nutritional fetal metabolic programming having garnered an individual NIH RO1, an R21, and R56 and co-mentored a number of MD, Ph.D., and Maternal-Fetal Medicine (MFM) and Pediatrics trainees. She is the Director of the Obstetric Diabetes Clinic at University Hospital and supervises the care of all providers in the management of pregnant women with diabetes. She has given multiple webinars sponsored by the CDC and Departments of Public Health in various states on obesity in pregnancy and gestational weight gain. The focus of her research is determining how the intrauterine metabolic environment in women with diabetes and obesity may program offspring to be at risk for pediatric obesity and metabolic syndrome. She serves as a peer reviewer for grant applications for the NIH, is Co-Editor of a textbook, has authored multiple original manuscripts, reviews, and textbook chapters and has given numerous national and international talks on obesity and diabetes in pregnancy. As Co-Director of the Colorado Program in Nutrition and Healthy Development, she supports translational and clinical research from young investigators in Obstetrics, Pediatrics, Medicine, and Public Health to promote nutritional and interventional strategies in obese and diabetic pregnancies to improve maternal and infant outcomes and long term risk of metabolic disease. In the last 5 years she has successfully co-mentored and helped to secure grant funding for a Pediatric Gastroenterologist researching the origins of pediatric Non-Alcoholic Fatty Liver Disease (NAFLD), a Pediatric Nutrition postdoc examining how breast milk composition effects postnatal fat development, a Pediatric Geneticist who is using metabolomics to understand metabolic signatures from offspring of obese diabetic mothers, a Pediatrics post-doc who is studying how the maternal and infant microbiome relate to metabolic risk and adiposity, a Pediatric Nutrition postdoc who is studying the adipogenic potential of cord blood mesenchymal stem cells from offspring of obese and GDM women, a MD/MPH General Internal Medicine junior faculty BIRWCH awardee who is examining mobile application strategies to facilitate postpartum weight loss, and an Epidemiology pre-doc examining maternal dietary composition and infant adiposity, all of whom have successfully competed for funding. Most recently, a RN/PhD investigator for whom she has been the primary mentor of for the last 10 years, successfully received NIDDK R01 funding for a RCT on diet interventions in GDM women. She is very pleased to serve as a research mentor for the Pediatric Nutrition T-32 and highly support this training mechanism which cultivates the development of highly promising junior investigators in maternal and infant nutrition toward the achievement of independent funding.

National Invited Speakers

Dr Naomi Achong

Naomi Achong completed a Bachelor of Science and MBBS at the University of Queensland. She undertook her Advanced Training in Endocrinology and Obstetric Medicine at the Princess Alexandra Hospital and the Royal Brisbane and Women's Hospital. She has a particular interest in endocrine diseases in pregnancy and is currently undertaking a PhD concerning insulin requirements in women with type 1 diabetes during pregnancy and breastfeeding. Naomi also has an interest in general endocrinology including diabetes, thyroid disease and parathyroid disease. She currently works privately and also publically at the Redland Hospital.

Professor Alex Brown

Professor Alex Brown is a Deputy Director and Theme Leader of Aboriginal Health Research in the newly established South Australian Health and Medical Research Institute. His previous research positions include Executive Director of Baker IDI Central Australia (2007-2012), and Menzies School of Health Research (2003-2007). He completed his PhD in 2010, and has been awarded an Honorary Fellowship of the RACP; Fellowship of the Cardiac Society of Australia and New Zealand, a Masters in Public Health in 1999 and Bachelor of Medicine in 1996. Most recently Alex was awarded a Viertel Senior Medical Research Fellowship to continue his unique work on psychosocial factors and cardiovascular disease in Aboriginal communities. Professor Brown has established a growing profile in cardiometabolic research in Aboriginal people, alongside significant national policy work. He has been a CI on grants worth over $30 million in the last 10 years. All of these grants are related to the principal multi-disciplinary research program addressing chronic disease disparities in Aboriginal Australians. Professor Brown has extensive experience in working in rural/remote communities, primary care and hospital settings, and has led detailed and extremely challenging fieldwork in Aboriginal community research. Professor Brown has a growing national and international profile in Indigenous health, particularly in relation to CVD, diabetes, chronic disease co-morbidity and psychosocial determinants of health.

Professor Leonie Callaway

Leonie Callaway is a Senior Specialist in Obstetric and Internal Medicine at the Royal Brisbane and Women's Hospital, and Professor of Medicine at the University of Queensland. Leonie's research interests include obesity and inflammation in pregnancy, with a particular interest at present on the role of probiotics in the prevention of gestational diabetes. She is CIA for a major NHMRC project grant relating to this issue. Leonie is currently President of the Australasian Diabetes in Pregnancy Society and Deputy Chair of the Queensland Maternal and Perinatal Quality Council.

Melissa Colombo

Melissa Colombo is an Accredited Practising Dietitian (APD) from the Women's and Children's Hospital, North Adelaide (WCHN) who specialises in maternal health. She has worked as a clinical dietitian for nearly a decade across South Australia and Queensland. Melissa is involved in the education of Nutrition & Dietetics students, Midwifery students and Diabetes Educators through university lecturing and postgraduate teaching in the areas of peri-natal nutrition and diabetes in pregnancy.

Dr Rosalie Grivell

Dr Rosalie Grivell is a NHMRC early career fellow within the Robinson Research Institute, Discipline of Obstetrics and Gynaecology, The University of Adelaide, and a maternal fetal medicine specialist and clinical researcher at the Women's and Children's Hospital. Rosalie's current research agenda incorporates key areas relating to the health of women and babies including obesity during pregnancy and early life approaches to obesity prevention. She plays a key leadership role in a large multidisciplinary research team that has active collaborations with and regularly interacts with national and international leaders in the field. The trials conducted by the group are the largest of their kind worldwide, generate novel information about disease mechanisms, and are of direct clinical, public health and policy relevance globally. Dr Grivell is an author on 36 peer reviewed publications, 2 book chapters and 43 published abstracts/conference presentations.

Shantha Joseph

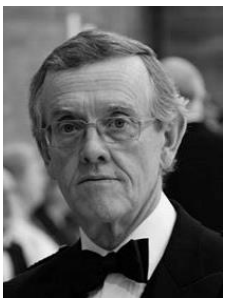
Shantha Joseph is a Staff Specialist at the Flinders Medical Centre, Adelaide where she is part of the Southern Adelaide Diabetes and Endocrine Services team providing clinical services in Endocrinology, Diabetes and Obstetric medicine. She is currently completing her Masters in Clinical Education through the Flinders University of South Australia. She has also worked as the Regional Director of Clinical Training supervising the progress of junior doctors in the Southern Adelaide Local Health Network and works privately at the Flinders Private Hospital.

Dr Sue Mei Lau

Sue Mei is a Staff Specialist at Prince of Wales Hospital and the Royal Hospital for Women, Randwick, where she runs a diabetes in pregnancy clinic, general endocrine clinic and a hereditary endocrine cancer clinic. She has a clinical research interest in diabetes in pregnancy. Sue Mei's PhD at the Garvan Institute of Medical Research was on the long term effects of diabetes in pregnancy on offspring metabolic phenotype. She continues her research in Professor Jenny Gunton's lab at the Westmead Millenium Institute, studying mouse models of beta cell dysfunction in pregnancy. Sue Mei is on the Programming Organising Committee for this year's Endocrine Society of Australia Annual Scientific Meeting. She has been fortunate to receive invaluable research support from ADIPS in the past, including 2 ADIPS Novo Nordisk Diabetes in Pregnancy research grants, and the Graz Clock prize.

Associate Professor Lousie Maple-Brown

Louise Maple-Brown is Head of Department of Endocrinology, Royal Darwin Hospital and an NHMRC Practitioner Fellow with Menzies School of Health Research, Darwin. Louise leads the clinical research program within the Wellbeing and Preventable Chronic Diseases division of Menzies, with a focus on diabetes and related conditions in Indigenous Australians. Currently Louise is the lead investigator on 2 large NHMRC-funded projects: The Northern Territory Diabetes in Pregnancy Partnership Project and The eGFR study (Accurate assessment and progression of kidney damage in Indigenous Australians). After completing the majority of her physician and endocrinology training at St Vincents Hospital Sydney, Louise moved to Darwin in 2002 to pursue her passion for improving the health of Indigenous Australians. Louise is currently on the Australian Diabetes Society Council and was previously a member of the Council of the Australasian Diabetes in Pregnancy Society (ADIPS).



Clincal Associate Professor Aidan McElduff

Clinical Associate Professor, Medicine, Northern Clinical School, The University of Sydney, NSW Australia. Dr Aidan McElduff is a clinical associate Professor in the discipline of medicine at Sydney University. He has a long-standing interest in the endocrinology of pregnancy and particularly, diabetes in pregnancy.

Professor David McIntyre

Professor David McIntyre trained in Endocrinology in Australia and Belgium. David's current research and clinical interests cover medical complications of pregnancy with particular interests in diabetes and obesity, regulation of fetal growth and intensive treatment of Type 1 and Type 2 diabetes. Recent research studies have examined the effects of diabetes, obesity and high blood pressure during pregnancy on the health of Mothers and Babies, both during pregnancy and with long term follow up. David is currently the Chair of the International Association of Diabetes in Pregnancy Study Groups (IADPSG). He has been closely involved in the translation of clinical research findings into clinical practice, in particular through the re definition of gestational diabetes and promotion of optimal diagnosis and treatment of this common pregnancy complication.

Professor Robert Norman

Professor Robert Norman is Professor of Reproductive and Periconceptual Medicine at the Robinson Research Institute, University of Adelaide. He currently serves on the NHMRC Research Committee as well as the NHMRC's Embryo Licencing Committee. He was the Founding Director of the Robinson Research Institute, which focuses on the early stages of life to improve the health and well being of children and families over the life-course and across generations. It comprises approximately 400 researchers including ten NHMRC Fellows. Professor Norman is a clinician scientist who has sub-specialised in reproductive medicine and endocrinology and is particularly interested in events around the time of conception. His expertise is in assisted reproduction, infertility management and polycystic ovary syndrome, a condition which is very commonly found in women across the reproductive and post-reproductive lifespan. He has been Chief Investigator on two NHMRC Program Grants and has had project, development and Centre of Research Excellence funding for the past two decades from NHMRC. He is currently Medical Director of a fertility clinic (Fertility SA), a Visiting Medical Specialist at the Royal Adelaide Hospital, a co-Director of the NHMRC Centre of Research Excellence for the origins, outcomes and optimal management of polycystic ovary syndrome. He remains a research active member of the Robinson Research Institute. He has recently been President of the Asia Pacific Initiative on Reproduction (ASPIRE) which is the largest society covering reproductive medicine in the Asia Pacific region. He became an Officer in the Order of Australia (AO) in 2013 and was awarded Fellowship of the Australian Academy of Health and Medical Sciences in 2015.

Dr Sarah Price

Dr Sarah Price obtained her medical degree from Monash University. She completed her Fellowship in Adult Medicine (Endocrinology) after training at Austin Health, Royal Melbourne Hospital and Eastern Health. She also holds Diplomas in Obstetrics and Gynaecology (RANZCOG) and Child Health (DCH, University of Sydney). Supported by an NHMRC post-graduate scholarship, she is currently completing her PhD in the health consequences for mother and baby of substantial pre-conception weight loss at the University of Melbourne. She is supervised by Professor Joe Proietto, Associate Professor Alison Nankervis and Professor Michael Permezel. She works in clinical trials at the Centre for Metabolic Disease (University of Melbourne) and has clinical appointments at Austin Health and the Royal Women's Hospital. This year she has had the pleasure of taking on the role of ADIPS Newsletter Editor.

Dr Janet Rowan

Janet Rowan is a general physician who found her way into the diabetes in pregnancy world while doing general obstetric medicine for a number of years. She is the physician lead in the diabetes in pregnancy service at National Women's, Auckland. This service currently cares for approximately 40 women with type 1 diabetes, 80 women with type 2 diabetes and 700 women with GDM each year. She is a clinician with clinical research interests, which she undertakes to answer the clinical uncertainties we all deal with. She was the PI for the metformin in gestational diabetes (MiG) trial and now The Offspring Follow Up (TOFU), with the 7-9 year old assessments completed in June 2015. She will present preliminary analysis from this study in Adelaide. One of her current interests is the role for HbA1c in early pregnancy, as a screening tool for prediabetes and diabetes and whether measuring HbA1c in late pregnancy might be useful for subsets of women.

Genevieve Scmidt

Genevieve is currently the Clinical Services Coordinator of the Women's Health Clinic at Flinders Medical Centre. This tertiary referral centre has approx. 3500 births per year, many of which have complex conditions. Her role also includes being the Obstetric Shared Care Coordinator liaising with GP's delivering care for low risk women.Genevieve is a nurse and midwife with 29 years of experience in women's health. She has worked in many rural and remote areas throughout Australia delivering care to many culturally and linguistically diverse cultures. Genevieve is currently involved in setting up a more streamlined multidisciplinary team to address the growing numbers of women diagnosed with gestational diabetes in the Southern Adelaide local Health Network. Genevieve holds a Bachelor of Nursing, Certificate in Midwifery, Diploma of Business and a Masters of Health Administration.

Professor David Simmons

David has just started as the Professor of Medicine at the University of Western Sydney Macarthur Clinical School and Head of the Campbelltown Hospital Endocrinology Department. He was until recently the lead diabetes consultant at Cambridge University Hospitals NHS Foundation Trust. Between 1998-2002 he was the Foundation Chair in Rural Health at the University of Melbourne and between 2003-2007 was the inaugural Professor of Medicine at the University of Auckland Waikato Clinical School. He has several national and international awards for his work in diabetes epidemiology, diabetes in pregnancy and diabetes service development with over 250 publications. He is a past president of the Australasian Diabetes in Pregnancy society (ADIPS), was one of the first co-chairs of the Australian National Diabetes in Pregnancy Advisory committee, was a member of the World Health Organisation technical working group on the criteria for hyperglycaemia in pregnancy, and remains trial coordinator for a multicenter RCT for the prevention of gestational diabetes across 9 European countries.

Mrs Maree Thus

Maree has worked as a Diabetes Educator for the past 19 years in NSW and South Australia. During this time she has worked in a variety of roles in the public and private sector including roles in clinical research. Currently is the Clinical Practice Consultant at the Women's and Children's Health Network in South Australia working with the Women's and Babies Division. Her main interests include Diabetes of all types in Pregnancy and Insulin Pump Therapy.

PROGRAM

Friday, 28th August 2015

Registration
8:00am - 9:00am

Welcome
8:45am - 9:00am

Symposium 1 – Pre-gestational diabetes and pregnancy
9:00am – 11:00am City Rooms 1 & 2
Chair: Helen Barrett & N Wah Cheung

9:00am **Robert Norman**
Preconception care and diabetes - parenting before conception *abs#001*

9:30am **David Simmons**
T2DM- Metformin treatment for Type 2 diabetes in pregnancy *abs#002*

10:00am **Sue Mei Lau**
T1DM- management of patients with insulin pumps through their pregnancy, labour/delivery and postpartum *abs#003*

10:30am **Naomi Achong**
Glycaemia during breast feeding and artificial feeding in women with type 1 diabetes *abs#004*

Morning Tea
11:00am - 11:30am City Rooms Foyer

ADS/ADIPS Novo Nordisk Skip Martin Conjoint Plenary Lectures
11:30am - 1:30pm City Rooms 1 & 2
Chairs: Bill Jeffries & Glynis Ross

11:30am **Linda Barbour**
Maternal Obesity - Optimizing Weight Gain for Maternal and Infant Health—Less is More? *abs#005*

12:30pm **Leonie Callaway**
Maternal Obesity: new insights *abs#006*

The conference would like to acknowledge novo nordisk®

Lunch
1:30pm - 2:00pm City Rooms Foyer

Symposium 2 – Gestational Diabetes
2:00pm - 3:30pm City Rooms 1 & 2
Chairs: Mark Morton & Robert Moses

2:00pm **David McIntyre**
Early diagnosis of hyperglycaemia in pregnancy - benefits and implications *abs#007*

2:30pm **Janet Rowan**
Metformin for GDM - but what about the offspring? *abs#008*

3:00pm **Aidan McElduff**
The "not so new" GDM diagnostic guidelines: Implementation Issues *abs#009*

Afternoon Tea & Free Time
3:30pm onwards

Saturday, 29th August 2015

Plenary Lecture

9:00am - 11:00am — City Rooms 1 & 2

Chair: David McIntyre & Simone Kane

9:00am **Linda Barbour**
Sugar, Fat and Big Babies—Is Maternal BMI or Diet to Blame? *abs#010*

10:00am **Rosalie Grivell**
The influence of maternal BMI, diet and physical activity on pregnancy outcomes - insights from the LIMIT randomised trial? *abs#011*

Morning Tea

11:00am - 11:30am — City Rooms Foyer

Symposium 3 – Diabetes in the Aboriginal population

11:30am - 1:00pm — City Rooms 1 & 2

Chairs: Mary Wicks & Glynis Dent

11:30am **Alex Brown**
Outcomes in pregnant Aboriginal women with diabetes -PANDORA study *abs#012*

12:15pm **Louise Maple Brown**
Health service delivery for women with Diabetes in pregnancy in remote Australia: Northern Territory Diabetes in Pregnancy Partnership *abs#013*

Lunch

1:00pm – 2:00pm — City Rooms Foyer

Symposium 4 - Oral Presentations

2:00pm - 3:30pm — City Rooms 1 & 2

Chairs: Jillian Lyon-Green & Erin Clark

2:00pm **Jas-mine Seah**
Obstetric Outcomes in Pregnancies Complicated by Pre-existing Maternal Diabetes According to Indicators of Diabetic Kidney Disease *abs#014*

2:15pm **Ana McCarthy**
When is the optimal time to deliver babies for pregnant women with diabetes? *abs#015*

2:30pm **Catherine Adam**
The Auckland MiG cohort : prevalence of diabetes in the mothers at two years postpartum *abs#016*

2:45pm **N Wah Cheung**
Is Obesity a Greater Risk Factor for Adverse Pregnancy Outcomes than GDM Diagnosed by IADPSG, but not 1998 ADIPS Criteria? abs*#017*

3:00pm **Tripti Joshi**
Poor neonatal outcomes in mothers with T1 diabetes compared to T2 diabetes abs*#018*

3:15pm **Tang Wong**
What is the influence of Pre-pregnancy BMI, Gestational Weight Gain and Antenatal Glucose Parameters on the risk of LGA in Women with Gestational Diabetes? abs*#019*

ADIPS Annual General Meeting

3:30pm - 4:00pm — City Rooms 1 & 2

Poster Presentations

4:00pm – 5:30pm City Rooms Foyer
Canapes and Drinks to be served
* Please see poster listing

Conference Dinner

7:00pm onwards Citi Zen Restaurant

Sunday, 30th August 2015

Symposium 5

8:30am – 9:15am City Rooms 1 & 2
Chair: Linda Burcher & Jui Ho

8:30am **Melissa Colombo**
Optimising diet in diabetic mothers- preconception, during pregnancy and postpartum ?
abs#020

Symposium 6 - Oral Presentations

9:15am – 10:30am City Rooms 1 & 2
Chair: Linda Burcher & Jui Ho

9:15am **Robyn Barnes**
A Model for the Prediction of Therapy Type in women with Gestational Diabetes Mellitus *abs#021*

9:30am **Angela Sheu**
The pro-inflammatory T cell phenotype in gestational diabetes and the postpartum period. *abs#022*

9:45am **Stella Liong**
Nobiletin from citrus fruit peels improves inflammation and insulin resistance associated with gestational diabetes mellitus. *abs#023*

10:00am **Brydie Purbrick**
Zinc Antenatal Health of Women with Gestational Diabetes in the Northern Territory: PANDORA Study abs*#024*

10:15am **Veronica Wong**
Estimates of the possible need for MODY testing for women with GDM abs*#025*

Coffee Break

10:30am - 11:00am City Rooms Foyer

Case Discussions – Expert Panel

11:00am – 12:30pm City Rooms 1 & 2
Chairs: Leonie Callaway and William Jeffries

11:00am **Panelist: Sarah Price, Shantha Joseph, Genevieve Schmidt, Melissa Colombo and Marie Thus**
Case Presentations: Dr Julie Chemmanam, Dr Emily Meyer, Dr Hui Shi
"The pointy end of diabetes in pregnancy" –reviewing management of complex diabetic pregnancies

Awards Presentation, concluding remarks and meeting close

12:30pm – 1:00pm City Rooms 1 & 2

Takeaway Lunch

1:00pm City Rooms Foyer

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Robyn Barnes
What are the clinical characteristics of women with GDM successfully managed using medical nutrition therapy alone? abs# 102
Alison Barry
Gestational Diabetes - Development of a clinical guideline abs# 103
Hannah M Barry
Observational audit of neonatal admissions to Special Care Nursery for hypoglycaemia in women with diabetes in pregnancy abs# 104
Catherine Chamberlain
Greater than a four-fold risk of progression from gestational diabetes to type 2 diabetes among Indigenous women, compared to non-Indigenous women, in Far North Queensland, Australia abs# 105
Evelyne Cheng
Birth outcomes in women with diet managed gestational diabetes: The PANDORA Study abs# 106
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Jeff Flack
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Jeff Flack
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Carley Francis
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Bronwyn Fredericks
Understanding Barriers and Facilitators to Postpartum Care among Aboriginal and Torres Strait Islander women with Gestational Diabetes: translating women's perspectives into informed action abs# 111
Jill Lyon-Green
Providing Diabetes Education services for Gestational Diabetes- A service model that continually evolves! abs# 112
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Catherine Kilgour
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Catherine M Kilgour
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ORAL ABSTRACTS

1

Preconception care and diabetes - parenting before conception

Rob Norman[1]

1. School of Paediatrics and Reproductive Health, The University of Adelaide, Adelaide, SA, Australia

Pre-conception care is the single best investment that we can make in preventing complications during pregnancy and long-term effects on the developing child and adult. It incorporates both short and long-term concepts of providing information to patients and assisting them to make significant lifestyle decisions that will optimise their chance for fertility and for fecundity. Well-known and successful interventions have included the use of folic acid to prevent open neural tube defects and iodine to prevent fetal brain damage due to hypothyroidism. Preconception care regarding genetic advice has proved to be very valuable in some conditions such as cystic fibrosis and removal of drugs that are thought to have significant effects on congenital abnormalities such as anti-epileptic medications have been shown to be effective.

There is now abundant evidence that congenital abnormalities can vary depending on preconception glucose levels. It is not only the very high-impaired glucose tolerance blood sugars that impact on the fetus but also high levels within the normal range. Optimising blood sugar control in diabetics before conception is attempted is a very viable option and will improve the chances of fertility and also reduce the risks to the fetus of being exposed to congenital abnormalities, pre-eclampsia and gestational diabetes. There is good animal evidence to suggest that an abnormal glucose environment impacts on the developing embryo prior to organogenesis and that exposure can occur in the fallopian tube and the endometrium before implantation.

This talk will concentrate on aspects of preconception care generally and then to look at the biology and psychology of providing preconception care to men and women with glucose abnormalities including diabetes mellitus.

2

T2DM- Metformin treatment for Type 2 diabetes in pregnancy

David Simmons[1]

1. University of Sydney, Penrith, NSW, Australia

Metformin lowers blood glucose by reducing hepatic glucose output, increasing insulin sensitivity and enhancing peripheral glucose uptake. Metformin is widely used in women with Type 2 diabetes of child-bearing age, many of whom become pregnant. Studies to date in Type 2 diabetes in pregnancy, gestational diabetes (GDM) and polycystic ovarian syndrome are reassuring. Metformin has not been shown to be teratogenic, and well- designed observational studies have not shown any harm if used throughout pregnancy. There is randomised controlled trial (RCT) evidence that metformin is associated with similar obstetric and perinatal outcomes when used in the third trimester in GDM, but no RCT evidence throughout pregnancy in women with type 2 diabetes in pregnancy. Women may benefit from the lesser weight gain. The long term risks to the offspring remain inadequately researched, with no evidence of harm up to 8 years, and no suggestions of later complications in countries using metformin for many years. Metformin is recommended for use in pregnancies complicated by Type 2 diabetes, but women should be informed of the evidence regarding its associated risks and benefits to enable an informed choice over its use.

3

T1DM- management of patients with insulin pumps through their pregnancy, labour/delivery and postpartum

Sue Mei Lau[1]

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

The rate of insulin pump use is increasing worldwide. Approximately 10% of people with Type 1 diabetes in Australia are on an insulin pump. With increasing pump use in the pediatric population, we will be seeing increasing numbers of women on insulin pumps in pregnancy.

Insulin pumps have been found to reduce hypoglycemia and improve HbA1c compared to multiple daily injections in non pregnant individuals in a number of studies, although evidence from randomised trials is not conclusive. Insulin pumps have not been shown to be more effective in pregnancy, with a lack of randomised, adequately powered trials. Potential advantages of pump therapy could include better nocturnal glycemic control, easier sick day management and greater flexibility with physical activity and meals. Insulin pump therapy can be individualised to help address the particular issues that are unique to a pregnancy. Suitability for insulin pump use in pregnancy needs to be assessed on a case by case basis, and further studies are required to identify which women stand to gain the most from an insulin pump.

This talk reviews the literature on insulin pump use in pregnancy, and also discusses day-to-day issues involved with starting and maintaining a woman on an insulin pump before, during and after pregnancy. There are few published guidelines on managing insulin pumps in pregnancy, and few clinical trials on which to base them.

4

Glycaemia during breast feeding and artificial feeding in women with type 1 diabetes

Naomi Achong[1]

1. Endocrinologist, Queensland

The glycaemic profile in women with type 1 diabetes (T1D) during breastfeeding is poorly described. In particular, it is unclear if an episode of suckling induces acute changes in maternal glycaemia. We conducted a prospective descriptive study using continuous glucose monitoring (CGM) in women with T1D to compare the glycaemic profile of breastfeeding and artificially feeding women. A group of historic controls ("clinic controls") were also identified. Our study indicated that breastfeeding women have a more stable glycaemic pattern than artificially feeding women or clinic controls. The risk of hypoglycaemia was similar in all groups of women. An episode of suckling acutely reduced maternal glucose levels but hypoglycaemia was uncommon. We discuss these results in detail and explore the mechanisms that may explain these results.

5

Obesity in pregnancy - Optimizing Weight Gain for Maternal and Infant Health—Less is More?

Linda Barbour[1]

1. University of Colorado, Aurora, COLORADO, United States

There are few areas in obstetric medicine as hotly contested as the optimal degree of gestational weight gain (or even weight loss) in overweight and obese pregnant women and the utility of interventions designed to limit gestational weight gain (GWG). Limiting GWG is one modifiable risk factor that may have significant potential to decrease the risk of childhood obesity and, according to WHO estimates, there will be 70 million obese children globally by 2025. Limiting GWG also decrease the risks of gestational diabetes (GDM), preeclampsia, cesarean delivery, postpartum weight retention, and long-term adverse metabolic outcomes in both mothers and infants. GWG less than the 2009 Institute of Medicine (IOM) guidelines in overweight and obese women has potential to further improve pregnancy outcomes and reduce large-for-gestational-age infants (LGA), an independent risk factor for childhood obesity. However, obese women are also at increased risk for having preterm and small-for- gestational age (SGA) infants, likely due to placental insufficiency, and there are concerns that targeting a lower GWG or even weight loss may further increase SGA in this population. The vast majority of studies investigating the effect of GWG on pregnancy outcomes in obese women have not controlled for maternal risk factors that may independently increase the risk of placental insufficiency, preterm birth, and SGA and broad recommendations on appropriate GWG for all obese women may not be feasible. Furthermore, most studies have analyzed the outcome of total GWG, rather than the timing of GWG, which may ignore that weight gain early versus late in pregnancy may modulate pregnancy outcomes by differentially adding to maternal fat deposition, worsening maternal insulin resistance, increasing the risk of GDM, or increasing fetal fat accretion. Tremendous efforts towards the execution of interventional trials to decrease excess GWG have met with some cynicism given they have only been modestly effective in improving pregnancy outcome. Critics who scrutinize the intensity and timing of the interventions challenge the value of conducting future trials. This talk examines the support for less GWG in overweight and obese women than recommended by the IOM, raises caveats that my limit the generalizability of these recommendations to all obese women, and queries whether interventional strategies designed to limit GWG and improve pregnancy outcomes are doomed by compliance issues, maternal-placental biology, or with appropriate modifications, have potential merit.

6

Maternal Obesity: new insights

Leonie Callaway[1]

1. University of Queensland, Herston, QLD, Australia

Maternal obesity remains a major public health issue, and a major clinical issue in the delivery of clinical care. It remains a key risk factor in many adverse pregnancy and neonatal outcomes, and is associated with a significant economic burden. The drivers of human obesity are fascinating - dietary advice and guidelines, the food industry, exercise, exercise guidelines, appetite regulation, industry drivers, endocrine disruptors within our food change, changes in lifestyle, medications, trauma. New insights into this fascinating area of medicine will be discussed

7

Early diagnosis of hyperglycaemia in pregnancy - benefits and implications

David McIntyre[1]

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

The optimal approach to diagnosis and treatment of hyperglycaemia in early pregnancy remains controversial. In high risk populations, the increasing prevalence of obesity and (potentially undiagnosed) diabetes in young women suggests the need for routine screening or at least a well targeted case finding approach. However, an approach primarily "designed" to detect undiagnosed diabetes will inevitably also result in detection of a much larger number of women with lesser degrees of hyperglycaemia in early pregnancy (impaired fasting glucose, impaired glucose tolerance, elevated HbA1c below the threshold for diabetes). Opinions abound in this area, but hard evidence regarding the optimal approach to these disorders is lacking. When such abnormalities are detected, treatment along the lines provided to women with "standard" GDM appears almost irresistible. This substantially increases costs (for example an additional 12 – 14 weeks of home glucose testing and additional clinic visits to a variety of health care professionals) but the additional benefits of early treatment remain undefined.

Further, no clear consensus exists regarding the use of burdensome but informative tests such as the OGTT, as opposed to convenient but less sensitive tests such as HbA1c or other markers of glycosylation. Variable concordance between pregnancy and non-pregnancy testing indications and diagnostic thresholds also poses practical problems for busy clinicians.

This presentation will focus on these issues, outline recent developments and foster a discussion involving ADIPS members, before coming to the inevitable conclusion that "more research is needed".

8

Metformin for GDM - but what about the offspring?

Janet Rowan [1]

1. National Women's Hospital, Auckland, New Zealand

Studies using metformin in pregnancy for women with GDM demonstrate that metformin is a suitable treatment option with respect to pregnancy outcomes. However, metformin is not used in a number of centres, as it freely crosses the placenta and long term effects on the offspring are not clear. Animal data report beneficial effects of metformin for the offspring if the fetus is in an environment of overnutrition (obese mother, high fat diet) but adverse effects if metformin is administered to a normal mother. There are limited human data, but early reports in offspring of women with PCOS or GDM treated with metformin suggest that there are no adverse effects on the offspring up to 8 years of age.

The aim of this talk is to review published offspring data and present preliminary data from the Metformin in Gestational diabetes: The Offspring Follow UP study (MiG: TOFU) in the Auckland 7-9 year olds. Between September 2012 and June 2015, 99 offspring (6/114 Middlemore site, 93/282 National Women's site) and their mothers were seen. Background information, maternal and child anthropometry and BIA, child DXA, abdominal MRI, liver MRS and fasting blood for glucose, insulin, HbA1c, leptin, adiponectin, LFTs, FBC, CRP were collected.

It will take many more years before long term data are generated. In the interim, at our institution, we use metformin as an option for women with GDM. However, when using metformin, we think it is wise to "think like a fetus" and consider the nutrient load the fetus is exposed to, rather than offering metformin to all women with GDM.

9

The "not so new" GDM diagnostic guidelines: Implementation Issues

Aidan McElduff[1]

1. *The University of Sydney, Sydney, NSW, Australia*

The "new" GDM diagnostic guidelines first proposed by the IADPSG in 2010 (1), and endorsed by the WHO in 2014 (2) are now being implemented in Australia, predominantly according to the ADIPS publication (3). The implementation of guidelines is not a simple process. Many guidelines are never implemented effectively. Implementation requires effective implementation strategies included multifaceted interventions, interactive education and clinical reminder systems (4 from South Australia). Local variations according to local needs, resources and patient populations are likely, particularly relating to the less well evidenced based recommendations. However, many general problems/issues arise. The purpose of this session is to discuss these issues in an interactive manner.

Issues include: the accuracy and precision of glucose measurements in your local lab; can you local lab cope with the increased number of GTTs: how should women with a positive result be triaged; who should provide primary care of the GDM; how should education about GDM, glucose monitoring, diet and exercise be administered; what treatment targets should be utilised and do these targets include factors other than glucose results; glucometers accuracy; how often should women be reviewed; what items need to be reviewed at each visit or should some be reviewed more frequently and if so, how; what care is required in the immediate postpartum and subsequently. This is not an exhaustive list.

Please be prepared to speak, very briefly, about your local experience.

1. Diabetes Care 2010; 33:676-682
2. Diabetes Research and Clinical Practice 2014;103: 341-63.
3. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf
4. Journal of Evaluation in Clinical Practice 14 (2008) 888–897

10

Sugar, Fat and Big Babies—Is Maternal BMI or Diet to Blame?

Linda Barbour[1]

1. *University of Colorado, Aurora, COLORADO, United States*

Given the strong associations between maternal diabetes and obesity and the risk of childhood obesity and glucose intolerance, the metabolic milieu of the intrauterine environment is now considered to be a critical risk factor for the genesis of adult diabetes and cardiovascular disease. The evidence of this fetal programming effect has become one of the most compelling reasons why optimizing maternal glycemia, identifying other nutrients contributing to excess fetal fat accretion, improving maternal insulin resistance and inflammation and emphasizing weight loss efforts before pregnancy are so critical and carry long term health implications to both the mother and the offspring. Although dietary modification may be a powerful tool to improve nutrient exposure to the fetus, there remains no consensus on the optimal diet for obese or GDM women. Epigenetics provides a conceptual framework of how metabolic factors (glucose, lipids, amino acids, growth factors, cytokines), as a result of mother's metabolism or her diet, could alter the DNA methylation and histone modification in the fetus to change gene expression. Such changes may modify number, growth, and function of many cells, promote adipogenesis, and increase the risk of developing childhood non-alcoholic liver disease (NAFLD). There are also data in animal and nonhuman primate models to support that maternal obesity and high lipid exposure can influence the offspring's mesenchymal stems cells to differentiate along the adipocyte rather than osteocyte or skeletal muscle pathways. Maternal insulin resistance shunts all nutrient excess to the fetus including glucose, triglycerides (TGs), free fatty acids (FFA), and amino acids, all of which can be used for fetal fat accretion. Postnatally, the infant microbiome, heavily influenced by the maternal microbiome and infant feeding practices, may influence the trajectory of fat deposition in the infants, especially given infants triple their fat stores in the first year of life. Estimating adiposity in newborns and infants, thought to be a better predictor of childhood obesity than weight alone, is in itself a serious challenge given a lack of standardization of modalities to assess infant body composition longitudinally. This talk highlights some of our findings, as well as those of other investigators, in the differences in glycemic and lipid profiles, mesenchymal stem cell differentiation potential, and breast milk composition in obese and normal weight women, the influence of maternal diet on maternal insulin resistance and pregnancy outcomes, and some of the metabolic and placental-mediated influences on the development of subcutaneous and hepatic fat in newborns.

11

The influence of maternal BMI, diet and physical activity on pregnancy outcomes - insights from the LIMIT randomised trial

Rosalie Grivell[1]

1. *Women's and Children's Hospital, Adelaide, SA, Australia*

Discipline of Obstetrics & Gynaecology, and the Robinson Institute, The University of Adelaide, South Australia

Department of Perinatal Medicine, Women's and Babies Division, Women's and Children's Health Network

Overweight and obesity during pregnancy is common and associated with well-recognised increased risk of pregnancy and birth complications. Increasingly, there is recognition of increased risk of adverse childhood outcomes, including development of obesity. There has been considerable research focus on antenatal dietary and lifestyle interventions for women who are overweight or obese to limit gestational weight gain, as a potential strategy to improve health outcomes for women and their infants. However, robust evidence about the efficacy of such antenatal interventions is lacking.

We conducted a multicentre, randomised trial, recruiting 2,212 women from three public maternity hospitals across South Australia, with a singleton pregnancy, between 10^{+0} and 20^{+0} weeks gestation, and body mass index (BMI) >25kg/m^2. Women were randomised to Lifestyle Advice (n=1,108) or Standard Care (n=1,104).

Women randomised to Lifestyle Advice participated in a comprehensive dietary and lifestyle intervention over pregnancy, delivered by research staff.

Women randomised to Standard Care received pregnancy care according to local guidelines, which did not include such information.

Findings from the LIMIT randomised trial indicate that provision of an antenatal dietary and lifestyle intervention for women who are overweight or obese is associated with a significant 18% relative risk reduction in the chance of infant birth weight above 4.0kg. Furthermore, women who received the intervention made significant, albeit modest changes to their diet and physical activity. From an economic perspective, the provision of the intervention was cost neutral for the health care system. The ongoing follow-up infants born to women who participated in this trial continues.

12

Outcomes in pregnant Aboriginal women with diabetes -PANDORA study

Alex Brown[1]

1. *SAHMRI, Adelaide, SA, Australia*

Not available at time of print

13

Health service delivery for women with diabetes in pregnancy in remote Australia: Northern Territory Diabetes in Pregnancy Partnership

Louise Maple-Brown[2, 1]

1. *Endocrinology Department, Royal Darwin Hospital, NT, Australia*
2. *Menzies School of Health Research, Darwin, NT, Australia*

In the context of the escalating epidemic of chronic diseases among Indigenous Australians, it is vital that we reduce risk as early as possible in the life course of an individual. We have developed a partnership between researchers, health care providers and policy organisations in the Northern Territory (NT), to address the issue of diabetes in pregnancy (DIP) in the high-risk population of the NT (where 38% of babies are born to Indigenous mothers). The aims of the NT DIP Partnership are to: improve systems and service delivery for all women in the NT with DIP; reduce the gap between evidence and clinical practice in relation to screening, management and post-partum follow-up of women with DIP and their babies; and to establish systems that enable close monitoring of relevant clinical outcomes for mothers and babies. The NT DIP Partnership is working to improve coordination of care between different healthcare providers, and we have established a central electronic clinical register to assist with improved care coordination. We are working to increase support and communication between health professionals by increasing the use of telehealth facilities, holding regular stakeholder forums for communication, conducting regular education sessions for remote primary health care staff, and providing regular updates with local data from the DIP Clinical register to maintain clinician engagement. Facilitating clinical forums between disciplines has allowed simple issues to be resolved in a timely manner. We have been overwhelmed by the enthusiastic engagement of health service providers to improve our models of care for DIP in the NT, and look forward to continuing to work together to improve outcomes in this important area.

14

Obstetric Outcomes in Pregnancies Complicated by Pre-existing Maternal Diabetes According to Indicators of Diabetic Kidney Disease.

Jas-mine Seah[1, 2, 3], **Ning Mao Kam**[1, 3], **Lydia Wong**[3], **George Jerums**[1, 3], **Leonid Churilov**[1], **Michael Permezel**[1, 2], **Alexis Shub**[1, 2], **Elif I. Ekinci**[1, 3], **Christine Houlihan**[2, 3]

1. *University of Melbourne, Carlton, VIC*
2. *Mercy Hospital For Women, Melbourne, VIC*
3. *Endocrinology, Austin Health, Heidelberg, VIC*

Introduction:

Adverse obstetric outcomes have been linked to the presence of diabetic kidney disease (DKD). We conducted a 10-year retrospective study of a single major tertiary hospital exploring obstetric outcomes in women with pre-existing diabetes according to indicators of DKD; reduced eGFR ±albuminuria.

Methods:

Clinical and biochemical characteristics of women with Type 1 (T1DM) (n=93) and Type 2 Diabetes (T2DM) (n=106) who delivered between 2004-2014 were recorded. Glomerular filtration rate was estimated using the Chronic Kidney Disease Epidemiology Cohort formula (eGFR). Stages of DKD were defined as Hyperfiltering, eGFR > 120ml/min/1.73m^2; Stage 1, 90-120ml/min/1.73m^2; Stage 2+, <90ml/min/1.73m^2. Albuminuria was determined using albumin creatinine ratio (ACR). Multivariable logistic regression models were formulated for major obstetric outcomes as the dependent variables and renal status (either eGFR or ACR), blood pressure, HbA1c, age, type of diabetes, and BMI as independent variables throughout pregnancy.

Results:

Compared to women with normoalbuminuria (n=109), women with microalbuminuria and macroalbuminuria showed higher proportion of pre-eclampsia, pre-term birth <32 or 37 weeks, small for gestational age and neonatal intensive care (Table). Using multivariable analysis, albuminuria was associated with higher risk of pre-eclampsia (OR5.2, 95CI 2.2-12.0, *p*=<0.001 pre-term birth <32 weeks (OR2.7, 95CI 1.1-6.3, *p*=0.02), and neonatal intensive care (OR1.9, 95CI 1.0-3.5, p=0.04).

When categorised by stages of DKD, compared to women with hyperfiltration (n=122), women with both stage 1 and stage 2+ DKD had higher risk of pre-eclampsia. There was an additional risk of neonatal intensive care admission and pre-term birth (<32 and <37 weeks) in the Stage 2+ DKD women (Table). Following multivariable analysis, the association of eGFR with these outcomes persisted. For every 1ml/min/1.73m^2 reduction in mean eGFR, the odds of developing pre-eclampsia increased by the factor of 1.04 (*p*=0.01, 95CI 1.01-1.07) and 1.04 for pre-term birth <32weeks (*p*=0.01, 95CI 1.01-1.07).

Table: Major Obstetric Outcomes According to Indicators of Diabetic Kidney Disease in Women with Type 1 and Type 2 Diabetes

	Microalbuminuria+ (n=24)	Macroalbuminuria+ (n=12)	Stage 1 DKD++ (n=56)	Stage 2+DKD++ (n=8)
	Compared to Normoalbuminuria (n=109)		Compared to Hyperfiltration (n=122)	
	Odds Ratio (95% Confidence Interval)			
Pre-eclampsia	6.9 (2.2-21.0) p=0.01	19 (4.5-82.8) p=0.001	3.4 (1.4-7.8.) p=0.005	9.2 (2.0-41.4) p=0.004
Pre-term Birth < 37 weeks	4.6 (1.8-11.8) p=0.001	6.9 (1.7-28.6) p=0.01	1.1 (0.6-2.2) p=0.71	15.5 (1.8-130.2) p=0.01
Pre-term Birth <32 weeks	5.6 (1.3-24.5) p=0.02	11.5 (2.1-61.6) p=0.004	2.0(0.6-6.2) p=0.24	27.4 (5.4-138.6) p=0.001
Neonatal Intensive Care	2.9 (1.1-8.0) p=0.03	3.6 (0.9-14.5) p=0.001	1.0 (0.4-2.3) p=0.96	15.3(2.9-81.3) p=0.001

- Albumin Creatinine Ratio (mg/mmol): Normoalbuminuria < 3.5; Microalbuminuria 3.5-35; Macroalbuminuria >35
- Diabetic Kidney Disease stages defined by Glomerular Filtration Rate estimated using Chronic Kidney Disease Epidemiology Cohort Formula (ml/min/1.73m^2):Hyperfiltration > 120; Stage 1 >90-120; Stage 2+ <90
- Univariate regression with results expressed as Odds Ratio (95%CI), in relation to either normoalbuminuria+ or hyperfiltration ++

Conclusion:

This study has provided additional evidence for the association of adverse maternal and fetal outcomes in pregnant women with pre–existing diabetes according to albuminuria status as well as eGFR level. Estimates of the associations between the prognostic factors and adverse outcomes should be regarded as exploratory and will need to be confirmed in subsequent studies

15

When is the optimal time to deliver babies for pregnant women with diabetes?

Ana McCarthy[1], William Jeffries, Wendy Scheil, Kamalesh Venugopal, Bill Hague, Ben Mol

1. *Flinders Medical Centre, Bedford Park, SA, Australia*

Existing literature shows an increased risk of fetal and neonatal death in pregnancies complicated by diabetes. However, data supporting the optimal timing of delivery for pregnant women with diabetes to prevent stillbirth and neonatal death are lacking. Our study sought to examine the occurrence of stillbirths and neonatal deaths in pregnancies complicated by diabetes, allowing comparison of the mortality risk of delivery with expectant management, thus inferring optimal time of delivery.

We performed a retrospective cohort analysis of all singleton births in South Australia between 20 and 42 weeks gestation from 1998 to 2012 using the existing Perinatal Statistics Collection. Pregnancies of women in the cohort with diabetes were grouped into two groups: pre-existent Type 1 or Type 2 diabetes and gestational diabetes. Live births, stillbirths and neonatal deaths were tabulated by completed week of gestation at birth. Cumulative risk of stillbirth was calculated. Additional risk of stillbirth for each continued week of pregnancy was compared with the risk of neonatal death at each of these gestational ages.

This study included 274,550 women: 1,537 women (0.6%) with pre-existent diabetes, 12,501 women (4.6%) with gestational diabetes and 260,512 non-diabetic women. There was an increased risk of stillbirth in pregnancies complicated by pre-existent diabetes compared with non-diabetic pregnancies (OR=4.1, 95% CI 2.9 – 5.6). The cumulative risk of stillbirth was highest in the pre-existent diabetes group at all gestations, and increased from 1.5% around 34 weeks, to the highest risk of 3.9% at 40 and 41 weeks. The cumulative risk of stillbirth from 28 weeks onwards in the gestational diabetes group very closely approximated that of the non-diabetic group, and increased in excess of the risk of neonatal death from 36 weeks gestation onward in pregnancies with pre-existent diabetes and from 40 weeks in non-diabetic pregnancies. The comparison for women with gestational diabetes was less clear, but the increase in cumulative risk of stillbirth peaked at 38 weeks.

These data vindicate the current policy for pregnant diabetic women birthing at 38 weeks gestation, and suggest that earlier timing of delivery should be explored in further studies using larger populations.

16

The Auckland MiG cohort : prevalence of diabetes in the mothers at two years postpartum

Catherine Adam[1], Janet Rowan[1]

1. *National Women's Health, Auckland, New Zealand*

BACKGROUND

Women diagnosed with gestational diabetes (GDM) are at increased risk of developing diabetes in the future. There are few data in New Zealand about rates of subsequent diabetes.

OBJECTIVE

The MiG trial recruited women with GDM who required pharmacotherapy. Our objective was to examine rates of diabetes in the Auckland cohort at 2 years postpartum and compare rates in women who attended follow up with those that did not attend.

METHOD

All women who consented to follow up were contacted at 2-3 years post delivery and invited for body composition measures. In those that attended, results of routine annual screening for diabetes were documented and, if not performed, further testing was recommended. For this study, OGTT/HbA1c/fasting glucose results at a mean of 2.2 (0.7) years were added to the database. Women were classified as being screened if they had testing beyond the initial 6 week postpartum test. ADA 2015 guidelines were used to classify women into three categories: diabetes, prediabetes, normal.

RESULTS

Of 436 women recruited in Auckland, 215 were seen at two years (group 1). Compared with women who were not seen (n=221, group 2), their fasting plasma glucose at randomisation was lower (5.2mmol/L vs 5.6mmol/L), more had tertiary education (48.8% vs 39.8%), more were Caucasian (40.5% vs 32.1%), more completed the 6 week postpartum OGTT (76.7% vs 63.4%) and results were more likely to be normal (75.2% vs 55.7%). In group 1, at the 2 year, mean BMI was 31.4kg/m², with mean weight loss 0.98kg (±24.3kg) from early pregnancy. In these women, 150 (69.8%) women had screening : 29 were newly diagnosed with diabetes (19.3%), 44 (29.3%) with prediabetes and 76(50.7%) were normal. In group 2, 53(24.0%) women had screening : 25(47.2%) were newly diagnosed with diabetes, 11 (20.8%) with prediabetes and 16 (30.2%) were normal. Overall, 58.1% of women with prediabetes at 6 weeks did not have further testing.

CONCLUSION

In Auckland, women requiring pharmacotherapy for GDM have high rates of diabetes two years after delivery and the highest risk women were less engaged with follow up.

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Is Obesity a Greater Risk Factor for Adverse Pregnancy Outcomes than GDM Diagnosed by IADPSG, but not 1998 ADIPS Criteria?

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The HAPO Study has shown both raised serum glucose and high BMI to be associated with adverse pregnancy outcomes. However the IADPSG criteria for GDM and guidelines for GDM management have focused on glucose measures only.

Aim: To assess pregnancy outcomes of patients who do not meet the 1998 ADIPS criteria for GDM, but who meet the IADPSG criteria, or are overweight/obese.

Methods: Since September 2015, Westmead Hospital has moved to universal testing for GDM with a 75g GTT, but retained the old 1998 ADIPS criteria. Women were categorised by their GTT results into 4 groups: 1) Not GDM by any criteria and untreated, 2) GDM by IADPSG criteria only and untreated (fasting BG 5.1-5.4 mmol/L or 1-hr BG>10 mmol/L and 2-hr BG<8.0 mmol/L), 3) GDM by 1998 ADIPS criteria only and treated (fasting BG<5.1 mmol/L, 1-hr BG<10 mmol/L, and 2-hr BG 8.0-8.4 mmol/L) 4) GDM by both criteria and treated (fasting BG≥5.5 mmol/L and/or 2-hr BG≥8.5 mmol/L). Pre-pregnancy BMI was used define obesity and overweight.

Results: To date, there are 984 women with 3 point GTT and pregnancy outcome data; Group 1: 78.3%, Group 2: 5.8%, Group 3: 3.3%, Group 4: 12.6%. Changing the GDM criteria would increase the incidence of GDM from 15.9% to 18.4%. Analysis of the untreated women only (Groups 1 and 2), demonstrated a higher incidence of large for gestational age (LGA) in Group 2 compared to Group 1 (33.3% vs 22%, p<0.05), but no differences in gestational hypertension (GHT), shoulder dystocia, caesarean section, or birthweight. Compared to normal weight women, obese women had a higher incidence of GHT (7.6% vs 1.1%, p<0.05), shoulder dystocia (15.1% vs 7%, p<0.05), and LGA (43.2% vs 17.5%, p<0.05). On multiple regression, BMI was a predictor of all the above adverse outcomes but being in Group 2 was not.

Conclusions: A change in the diagnostic criteria for GDM would increase its incidence, and identify additional women at risk of LGA. However, using BMI rather than IADPSG GDM criteria better identifies additional pregnancies at risk, and doing so would facilitate more efficient targeting of interventions.

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Poor neonatal outcomes in mothers with T1 diabetes compared to T2 diabetes.

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Introduction: T1D and T2D mothers and their babies are at high risk. This study compared maternal and neonatal outcomes in T1D and T2D women at a tertiary referral centre in Newcastle, Australia 2009-2013.

Methods: Retrospective analysis of 169 T1D and 80 T2D women managed in joint endocrine and obstetric clinic. Data was collated from electronic records, reported as mean (±SD) and analysed using chi-squared and logistic regression.

Results: Women with T1D were younger (28±6 vs. 33±6 years; p<0.0001), less overweight (27.3 ±6.3 vs. 34.7 ± 9.7kg/m^2; p<0.0001), non-smokers (85% vs. 73%; p=0.020) and of lower parity (1±1 vs. 2±2; p<0.0001), when compared to T2D. They were of similar socio-economic status (p=0.55). The prevalence of hypertension (31% vs. 39%; p=0.22) and microvascular complications were not significantly different, except for retinopathy (14%; vs. 0% p=0.0005).

First trimester HbA1c was higher in T1D (7.6±2.1%; vs. 6.7±1.4% p=0.012), but similar through trimester two (6.5±1.5%; vs. 6.2±1.3% p=0.18) and three (6.3±1.8%; vs. 6.1±1.6% p=0.50). The rates of preeclampsia were similar in both groups (12% vs. 11%; p=0.88). Women with T1D had increased rates of preterm labour (48% vs. 40%; p=0.241) and instrumental deliveries (8.3% vs. 1.3%; p=0.042), and lower rates of vaginal delivery (25% vs. 38%; p=0 043). The rates of caesarean section (66% vs. 61% p=0.44), both elective and emergency, were similar in both groups.

Neonates of women with T1D had increased rates of hypoglycemia (52% vs. 38%; p=0.04); resuscitation (62% vs. 29%; p<0.001); respiratory distress (34% vs. 22%; p=0.245), neonatal jaundice (49% vs. 30%; p=0.006), macrosomia (16% vs. 15%; p=0.05), shoulder dystocia (6.5% vs. 0.0%; p=0.02) and admission to NICU (73% vs. 50%; p=0.001). The rates of congenital malformation (18% vs. 18%; p=0.85) and stillbirth (1.2% vs. 1.3%; p=0.96) were similar in both groups.

Conclusion: Women with T1D had poorer neonatal outcome, even though women with T2D were older, with higher BMI, and were more likely to smoke. Women with pre-existing diabetes have high rates of caesarian section, neonatal hypoglycemia and NICU admission. Universal preconception care would be a valuable intervention to address the differing needs of these two high risk groups.

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What is the influence of Pre-pregnancy BMI, Gestational Weight Gain and Antenatal Glucose Parameters on the risk of LGA in Women with Gestational Diabetes?

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Background: The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study established association between antenatal glucose parameters and large for gestational age (LGA) infants. Our institution previously published that elevated pre-pregnancy BMI and excessive gestational weight gain (eGWG), are independent predictors of large for gestational age infants[1]. Additionally, women with an elevated BMI in the context of gestational diabetes (GDM) ar e at even higher risk of LGA[2].

Aims: To examine the relationship of pre-pregnancy BMI(≥25kg/m^2), eGWG and antenatal 75g oral glucose tolerance test results on LGA risk.

Methods: A retrospective cohort study of 3248 pregnancies in 2759 GDM women (1993-2013), at Bankstown-Lidcombe Hospital. GDM was defined according to ADIPS (1998) Australian criteria. eGWG was classified according to Institute of Medicine maternal weight gain targets for the entire pregnancy, stratified according to pre-pregnancy BMI. Chi-square analyses and odds ratios (ORs) were calculated using 2x2 contingency tables and logistic regression used to determine adjusted ORs for LGA (ethnic specific birth weight>90th percentile).

Results: LGA rate was 14.6% overall. Fasting blood glucose level (FBGL≥5.5mmol/L), eGWG and BMI≥25kg/m^2 were positive predictors of LGA. There was a lack of relationship between LGA and 2-hour glucose level (2hrBGL) ≥ 8.0mmol/L. On binary logistic regression, only FBGL≥5.5mmol/L and eGWG were independent predictors. ORs of LGA are shown in Table 1. BMI≥25kg/m^2 did not confer any additional risk to that conferred by FBGL≥5.5mmol/L, or eGWG. However, those with both eGWG and FBGL≥5.5mmol/L had an OR of 2.8 (95% CI 2.2 – 3.5) for LGA.

Table 1	Unadjusted OR (95% CI)	*Adjusted OR (95% CI),
Pre-pregnancy BMI≥25kg/m² (n=1595/3248)	1.6 (1.3 - 1.9)	NS
eGWG (n= 1215/3179)	2.5 (2.1 - 3.1)	2.2 (1.8 – 2.7)
FBGL≥5.5mmol/L (n=999/3248)	2.0 (1.7 – 2.5)	1.7 (1.3 – 2.1)
2hrBGL≥8.0mmol/L (n=2520/3248)	0.6 (0.5 – 0.8)	NS

*Adjusted for elevated BMI, FBGL, 2hrBGL, and excessive GWG.

Discussion: Only eGWG and FBGL≥5.5mmol/L were positive predictors of LGA on logistic regression modelling. Pre-pregnancy BMI≥25kg/m^2 did not confer additional risk. eGWG resulted in the highest risk of LGA. A combination of eGWG with FGL≥5.5mmol/L conferred almost a 3-fold risk of LGA.

Conclusion: In this cohort,eGWG had the highest OR for LGA, independent of pre-pregnancy BMI. GDM management must also focus on GWG, hence a glucose-centric approach should be avoided.

Acknowledgements: We wish to thank all the Diabetes Educators who have collected data and maintained the database.

1. Barnes RA, Edghill N, Mackenzie J, Holters G, Ross GP, Jalaludin BB and Flack JR. Predictors of large and small for gestational age birthweight in offspring of women with gestational diabetes mellitus. Diabet. Med. 2013; 30, 1040–1046
2. Catalano PM et al. Association of GDM and obesity with pregnancy outcomes; The Hyperglycemia and Adverse Pregnancy Outcomes Study Group. Diabetes Care. 2012; 35:780-786.

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Optimising diet in mothers with diabetes- pre-conception, during pregnancy and post-partum

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Poorly controlled diabetes pre-conception or during pregnancy, either with first onset in pregnancy or pre-existing Type 1 or 2, is associated with adverse maternal and neonatal outcomes. The increased incidence of Type 2 diabetes and risk factors such as pre-pregnancy weight status and maternal age has resulted in an increased incidence of hyperglycemia in pregnancy. In South Australia, gestational diabetes affects 1468 women (7.2%) per year (Pregnancy Outcome in South Australia 2012). Lifestyle changes such as dietary modifications or Medical Nutrition Therapy (MNT) delivered by an Accredited Practicing Dietitian (APD) is the primary therapeutic strategy to achieve euglycemia. The role of the Dietitian is to achieve three key goals: 1. To achieve and maintain acceptable glycaemic targets, 2. To meet the nutritional requirements of pregnancy for maternal and foetal health, and 3. To achieve healthy weight gain in pregnancy. Glycaemic control alone is not enough to prevent foetal overgrowth. While weight loss is pregnancy is not advised, excessive maternal weight gain in pregnancy may contribute to foetal overgrowth and potentially increase the prevalence of obesity in future generations. A 2011 survey of Australian Dietitians (Morrison et al., 2011) revealed variations in dietetic service and intervention for gestational diabetes, although key education themes were common including carbohydrate intake and distribution, glycaemic index, core food groups and pregnancy requirements. A 2013 Cochrane review (Han et al, 2013) was unable to demonstrate effectiveness of one particular diet strategy over another due to the small size of the studies included. No Australian guidelines exist to guide frequency and degree of dietetic input, with most services offering initial group education sessions within a multi-disciplinary environment. Adequate education to support lifestyle modifications should continue post partum with factors such as breastfeeding and preventing excessive weight gain between pregnancies to reduce risk of future hyperglycemia in pregnancy

1. Pregnancy Outcome in South Australia 2012, Pregnancy Outcome Unit, 2014, SA Health
2. Morrison M et al. Dietetic Practice in the management of gestational diabetes mellitus: A survey of Australian dietitians. Nutrition & Dietetics 2011; 68: 189-194.
3. Han S, Crowther SA, Middleton P, Heatley E, Different types of dietary advice for women with gestational diabetes mellitus (Review), The Cochrane Library, 2013, Issue 3

A Model for the Prediction of Therapy Type in women with Gestational Diabetes Mellitus

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Background: Identification of women with Gestational Diabetes Mellitus (GDM) who are more likely to require insulin therapy versus those able to be managed by Medical Nutrition Therapy (MNT) alone could enable risk stratification and triaging into risk-based models of care. This has previously been attempted with limited success(1-3).

Aim: To develop a model to predict therapeutic management in women with GDM.

Methods: We analysed de-identified prospectively collected data (1993-2014), for women diagnosed with GDM by ADIPS (1998) Australian criteria(4) in our multi-ethnic high-risk cohort. We chose clinically relevant variables previously found to be statistically significant in predicting insulin initiation. Seven dichotomous items were included in a multiple regression model: maternal age >30 years, family history of diabetes, pre-pregnancy obesity (BMI ≥30 kg/m2), prior GDM, early diagnosis of GDM (<24 weeks gestation), fasting BGL ≥5.3 mmol/L, and HbA1c at GDM diagnosis ≥5.5%.

Results: Of 4023 women, a total of 3317 had complete data. All variables assessed remained significant as predictors of therapy type in the model. The Table shows the number of predictors present and the corresponding percentage of women requiring MNT only versus MNT+Insulin (MNT+I) therapy.

Number of predictors present	MNT only n= (%)	MNT+I n= (%)
0	175 (90.7)	18 (9.3)
1	522 (85.3)	90 (14.7)
2	620 (75.3)	203 (24.7)
3	549 (69.1)	246 (30.9)
4	265 (52.0)	245 (48.0)
5	107 (39.5)	164 (60.5)
6	12 (14.3)	72 (85.7)
7	2 (6.9)	27 (93.1)
Total	2252 (67.9)	1065 (32.1)

MNT=Medical Nutrition Therapy

MNT+I=Medical Nutrition Therapy plus Insulin

Conclusion: In this GDM cohort, prediction of therapy type could be determined based on the number of predictors present, with 85.7-93.1% requiring MNT+I when 6-7 predictors were present compared to 85.3-90.7% treated with MNT only when 0-1 predictors were present. Assessment of these readily available clinical variables could assist risk stratification and triaging. In this model, almost one quarter (24.3%) could be considered low-risk for MNT+I (0-1 variables present) and considered for management in a low-risk setting.

Acknowledgements: We wish to thank all the Diabetes Educators who have collected data and maintained the database.

1. 1. Pertot T, Molyneaux L, Kris T et al. Can Common Clinical Parameters Be Used to Identify Patients Who Will Need Insulin Treatment in Gestational Diabetes Mellitus. Diabetes Care, 2011; 34: 2214-2216.
2. Wong V and Jalaludin B. Gestational diabetes mellitus: Who requires insulin therapy? Australian and New Zealand Journal of Obstetrics and Gynaecology, 2011; 51: 432-436.
3. Sapienza AD, Fransisco RPV, Trindade TC, Zugaib M. Factors predicting the need for insulin therapy in patients with gestational diabetes mellitus. Diabetes Research and Clinical Practice, 2010; 88: 81-86.
4. Hoffman L, Nolan, C, Wilson, JD, Oats JJN, Simmons D. Gestational diabetes mellitus management guidelines. The Australasian Diabetes In Pregnancy Society. MJA 1998; 169: 93-97.

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The pro-inflammatory T cell phenotype in gestational diabetes and the postpartum period.

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BACKGROUND:

Pregnancy is a state of immune tolerance that prevents maternal rejection of the foetus. Conversely, type 2 diabetes is associated with an increase in the ratio of pro-inflammatory CD4 T cells (Th17 cells, Th17.1 cells, Th1 cells and CD4+CD161+ cells) to anti-inflammatory T cells (T regulatory cells (Treg)) in peripheral blood. Other studies show increased levels of serum proinflammatory cytokines in gestational diabetes (GDM). We hypothesise that GDM is an inflammatory state associated with a failure of the normal upregulation of immune tolerance that occurs in pregnancy.

AIM:

To characterise the CD4 T cell subsets in GDM women, during and after pregnancy.

METHODS:

GDM women and age- and BMI-matched controls were prospectively recruited from our antenatal clinic. Exclusion criteria included multiple pregnancy, preeclampsia/hypertension, immunosuppressive medication and autoimmune disease. Using 9-colour flow cytometry, we compared the frequencies of circulating CD4+CD161+cells, Th1, Th17, Th17.1 and Treg cells in peripheral blood collected at 37 weeks gestation and 7 weeks postpartum.

RESULTS:

There were 31 GDM and 27 control women. At 37 weeks, GDM women had greater levels of CD4+CD161+ cells (13.4±7.1%, mean±SD, p=0.016, expressed as % of total CD4), and a trend to increased Th17 and Th17.1 cells. The ratio of each of these cell types to Treg was also increased. Treg numbers remained the same. Postpartum, there were no differences in levels or ratios in any of these cell types. While there was no correlation between CD4 T cell subsets and HbA1c, fructosamine or mean home blood glucose levels, there were significant correlations between the fasting, 1-hour and 2-hour glucose on the diagnostic glucose tolerance test during pregnancy and pro-inflammatory T cell numbers at 37 weeks gestation.

CONCLUSIONS:

GDM was associated with an increased pro-inflammatory cell to Treg ratio, which was the result of increased numbers of pro-inflammatory cells rather than a deficit in Tregs. These changes were no longer observed in the postpartum period, suggesting that alterations in immune tolerance in GDM are unique to pregnancy. Lack of correlation between inflammatory status and glycaemic control at 37 weeks suggests hyperglycemia is not a cause of the inflammation.

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Nobiletin from citrus fruit peels improves inflammation and insulin resistance associated with gestational diabetes mellitus.

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Infection and/or inflammation are key regulators of insulin resistance and inflammation; two central features involved in the pathophysiology of gestational diabetes mellitus (GDM). Recent studies have associated nobiletin, a citrus flavonoid found in the pith of citrus fruits, with many beneficial health properties. Nobiletin has been shown to decrease both inflammation and improve insulin sensitivity in animal models of diabetes. However, there are currently no studies that have investigated the effects of nobiletin in pregnancies complicated by GDM. In this study, using bacterial and viral products (lipopolysaccharide (LPS) and poly(I:C), respectively) and the pro-inflammatory cytokine TNF-α as a model of GDM, we examined the effects of nobiletin on inflammation in placenta, human umbilical vein endothelial cells (HUVECs), subcutaneous adipose and skeletal muscle tissues from pregnant women. The effect of nobiletin on insulin resistance in skeletal muscle tissue was also studied.

Pro-inflammatory cytokine gene expression and secretion in human placenta, subcutaneous adipose, skeletal muscle tissues and primary HUVECs were determined by qRT-PCR and ELISA, respectively. Given that endothelial cell dysfunction is a consequence of GDM, cell migration in HUVECs was also determined by scratch assay. Western blotting and glucose uptake assays were performed on skeletal muscle tissue to determine the effect of nobiletin on the insulin signalling pathway.

Nobiletin significantly reduced LPS, poly(I:C) and TNF-α-stimulated IL-6, IL-8, IL-1α/β and MCP-1 expression and release in placenta, subcutaneous adipose and skeletal muscle tissues. In HUVECs, treatment with nobiletin decreased LPS-induced IL-6 and MCP-1 expression and release. Nobiletin also blunted LPS-induced endothelial cell migration in HUVECs. In skeletal muscle tissue, nobiletin increased glucose transporter (GLUT)-4 expression and glucose uptake impaired by LPS, poly(I:C) and TNF-α.

In conclusion, we have shown nobiletin to exert anti-inflammatory and anti-angiogenic effects on HUVECs and also reduces inflammation in placental, adipose and skeletal muscle tissues obtained from pregnant women. Excitingly, nobiletin also improved glucose uptake impaired by LPS, poly(I:C) and TNF-α in skeletal muscle tissue. Collectively, these findings indicate nobiletin may have potential benefits in the prevention of GDM in pregnant women. The in vivo effects of nobiletin in a GDM mouse model is currently being undertaken.

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Antenatal Health of Women with Gestational Diabetes in the Northern Territory: PANDORA Study

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The Northern Territory (NT) covers a large geographical area. Thirty eight per cent of babies are born to Indigenous mothers who have higher rates of Gestational Diabetes (GDM) compared to non-Indigenous mothers. The Pregnancy and Neonatal Diabetes Outcomes in Remote Australia study (PANDORA) is a prospective birth cohort study recruited from a diabetes in pregnancy register. The aim of this analysis is to describe the maternal characteristics and antenatal health of women with GDM.

All women with diabetes aged 16 years and over, receiving antenatal care in the NT are eligible for PANDORA. 409 women with GDM who birthed between November 2011 and July 2014 were included in this analysis. Data was analysed using t-tests, chi-squared tests; logistic regression.

Indigenous, compared to non-Indigenous mothers with GDM were younger (29.9 vs. 31.8 yr, p=0.001), had a higher average BMI (28.7 vs. 26.1 kg/m^2, p=0.003) and a higher proportion of obesity (43.1 % vs 29.9%, p <0.001) at their booking visit. They were more likely to live in regional or remote areas (65.4 vs. 6.1%, p<0.001). Indigenous women were less likely to present in the first trimester for initial antenatal care (58.1% vs 74.1%, p<0.001), were less likely to have a first trimester ultrasound (60% vs. 81.7%, p<0.001) scan and were more likely to be anaemic (Hb <110, 20.0% vs. 9.0%, p=0.001). Among Indigenous women, 17% were diagnosed with GDM using an OGTT before 20 weeks. After adjusting for remoteness, Indigenous women with GDM remained less likely to have a 1st trimester ultrasound (OR 0.45, 0.25-0.82) but the difference in first trimester presentation was no longer significant (OR 0.70, 0.39-1.3).

Indigenous women with GDM in the NT are younger than non-Indigenous women, but are more likely to be anaemic and present later for antenatal care. A potential limitation of this study is selection bias. Despite the challenges of remote antenatal care delivery in the NT, results are encouraging for rates of early ultrasound and OGTT. This analysis highlights the uptake of new guidelines for early OGTT screening of this high-risk population, with further work in progress to describe the associated outcomes.

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Estimates of the possible need for MODY testing for women with GDM

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Maturity onset diabetes of the young (MODY) can result from various gene mutations of which the most common is the glucokinase (GCK) gene. Fasting hyperglycaemia may be first detected during pregnancy. If possible, a diagnosis of MODY is important to differentiate from gestational diabetes mellitus (GDM) as treatment of the mother to lower glucose levels may have adverse effects on the foetus. Recently, new criteria have been suggested using a fasting glucose ≥5.5mmol/L and a pre-pregnancy Body Mass Index (BMI; in kg/m2) of <25 with applicability to pregnancy. Data from Royal Prince Alfred Hospital have suggested that 6.1% of pregnant women should be considered for testing. We reviewed this situation using a local database of women seen with GDM.

The data of all women diagnosed and seen with GDM by one of us (RGM) were considered. This included women referred from both the antenatal clinic and private obstetric care providers from a population very similar to the overall Australian demographics. The data was reduced to 2,519 women by exclusion of multiple pregnancies, women with more than one episode of GDM (361), duplicate or missing data (57), diabetes (115) and year seen outside of the old ADIPS criteria, 1991-2010 (215). Of the 2,519 women, 2354 (93.4%) had a BMI based on pre-pregnancy weight and 1071/2354 (45.4%) had a BMI<25. Fasting glucose result was absent in 384 records. Of the remaining 687 records, 126 (18.3%) women had a fasting glucose≥5.5 and BMI<25. Hence, they would be advised to be tested for GCK–MODY. With the old ADIPS criteria, the prevalence of GDM is 9.6%–thus for every 1,000 pregnancies, MODY is possibly present for 8 women (0.8%).

Based on this assumption, the new ADIPS criteria, with lower fasting glucose levels and a prevalence of 13.0%, will not affect the proportion of women to be considered for testing. The advantages of a known diagnosis of MODY during pregnancy are without dispute. However, the health economics will need to be considered. A second pregnancy, post-partum testing and knowledge of the family history may help to refine the number of women who may need testing.

1. Rudland VL , ADA 2015, P 1435.
2. Moses RG, Diabetes Care 1995; 18: 886
3. Moses RG, MJA 2011; 194: 338-340

POSTER ABSTRACTS

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Attitudes to Fasting During Ramadan with Diabetes in Pregnancy

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Background: Our institution services an ethnically diverse region, with 26.4% of the Bankstown population identifying as Muslim. Muslim women with diabetes in pregnancy may face a dilemma regarding fasting during Ramadan. There is little literature exploring their beliefs and practices regarding this.

Aims: To gain an understanding of attitudes and actions of pregnant Muslim women regarding religious obligations and risks of fasting whilst pregnant, particularly if there is diabetes in pregnancy, and to use this information to develop guidelines regarding fasting for Muslim women with diabetes in pregnancy and their health providers.

Methods: Prospective survey of self-identified Muslim pregnant women, recruited from our centre during the month of Ramadan 2014 with questionnaires administered during the diabetes antenatal clinic. Resultant guidelines were assessed in a sample of pregnant Muslim women before Ramadan 2015.

Results: Of completed surveys (n=29), 86% women had gestational diabetes[GDM], 10% type 1 diabetes and 1 woman had type 2 diabetes. Almost 40% thought abstaining from fasting was either not permissible from the religious viewpoint or were unsure; only 72% thought it was permissible to do fingerprick glucose testing whilst fasting. This has important safety implications, particularly if women require insulin therapy. Over 50% stated they would fast with diabetes in pregnancy, while 93% said they would fast during pregnancy if they did not have diabetes. The most common factors influencing the decision to fast: baby's health, personal health, religious ruling, and doctors' advice, with over 70% identifying their baby's health as the main influence.

Conclusion: Although from both medical and religious viewpoints it is agreed that women with diabetes in pregnancy should abstain from fasting during Ramadan, some women will fast regardless. Knowledge regarding permissibility to abstain from fasting, and of fingerprick glucose testing not invalidating their fast was limited, and the effect on the baby's health most influences a mother's decision to fast. Evidence based information covering these issues needs to feature very strongly when counselling pregnant women about fasting.

Information sheets for patients and for health practitioners have been developed as part of this project and through the ADIPS-Novo Nordisk education grant awarded in 2012.

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What are the clinical characteristics of women with GDM successfully managed using medical nutrition therapy alone?

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Background: Insulin resistance and reduced pancreatic beta cell reserve both contribute to the development of gestational diabetes (GDM). There are varying degrees of severity with some women requiring insulin therapy in addition to the mainstay management of Medical Nutrition Therapy (MNT). Identification of factors associated with the initiation of insulin therapy could assist in identifying women who are more likely to be successfully managed with MNT alone and potentially managed in a lower-risk setting. Aim: To compare clinical and laboratory characteristics of women with GDM treated with MNT alone versus MNT plus Insulin (MNT+I), to achieve equivalent glycaemic targets.

Methods: Retrospective audit of prospectively collected de-identified clinical data from the Bankstown-Lidcombe Diabetes Centre database analysed for singleton births in women with GDM diagnosed according to ADIPS (1998) Australian criteria(1) (1993-2014). We compared MNT women versus MNT+I women across a range of clinically relevant parameters, thence assessed the outcome of Large for Gestational Age (LGA) between therapy types.

Results: The Table summarises clinical and laboratory variables associated with therapy type. Prior GDM, previous fetal macrosomia, family history of diabetes, ethnicity, maternal age, nulliparity, pre-pregnancy obesity (BMI ≥ 30 kg/m2), maternal weight gain (total and according to Institute of Medicine (IOM) criteria(2)), gestational age at diagnosis, fasting BGL and HbA1c at GDM diagnosis were all found to be significantly different between therapy types.

Table 1 Parameter	MNT only Mean ± SD or n= (%)	Insulin Mean ± SD or n= (%)	P-value
Total	2713 (67.6%)	1302 (32.4%)	
Clinical parameters			
Prior GDM	532 (19.6)	131 (33.1)	<0.001
Previous Fetal Macrosomia (>4kg)	219 (8.1)	148 (11.4)	<0.001
Family history of diabetes	1462 (53.8)	873 (67.0)	<0.001
Ethnicity			<0.001
European	559 (20.6)	336 (25.8)	
Middle Eastern	706 (26.0)	431 (33.1)	
East/South-East Asian	1020 (37.6)	298 (22.9)	
South Asian	294 (10.8)	160 (12.3)	
Others	137 (5.0)	78 (6.0)	
Age	31.8 ± 5.5	32.5 ± 5.3	<0.001
Nulliparity	945 (34.8)	380 (29.2)	<0.001
Obesity (pre-pregnancy BMI ≥ 30 kg/m^2)	468 (17.7)	487 (38.1)	<0.001
Gestational age at diagnosis (weeks)	27.9 ± 5.3	24.6 ± 6.5	<0.001
Fasting BGL in OGTT	5.0 ± 0.7	5.5 ± 1.0	<0.001
HbA1c at GDM diagnosis	5.2 ± 0.6	5.5 ± 0.7	<0.001
Total maternal weight gain	12.0 ± 5.9	12.6 ± 6.7	<0.01
Maternal weight gain compared to IOM			<0.001
Below IOM guidelines	837 (32.8)	246 (20.0)	
Within IOM guidelines	831 (32.5)	357 (29.0)	
Above IOM guidelines	886 (34.7)	629 (51.1)	

IOM = Institute of Medicine

The LGA rate was significantly greater for MNT+I compared to treatment with MNT alone (19.9%vs12.0%, p<0.001).

Conclusions: In this multi-ethnic high-risk cohort of GDM women, there are a number of significant clinical variables that are associated with successful treatment with MNT only. The identification of these clinical characteristics and laboratory measures may enable prediction of which women with GDM are more likely to be suitable for management by MNT alone in a lower-risk setting.

Acknowledgements: We wish to thank all the Diabetes Educators who have collected data and maintained the database.

1. Hoffman L, Nolan, C, Wilson, JD, Oats JJN, Simmons D. Gestational diabetes mellitus management guidelines. The Australasian Diabetes In Pregnancy Society. MJA 1998; 169: 93-97.
2. Institute of Medicine. Weight Gain During Pregnancy: Reexamining The Guidelines. Report Brief: May 2009. National Academies Press, 500 Firth Street, N.W., Lockbox 285, Washington DC.

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Gestational Diabetes - Development of a clinical guideline

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Queensland Clinical Guidelines (QCG) is responsible for developing maternity and neonatal clinical guidelines for use by clinicians to aid in delivering safe quality, evidence based care in metropolitan, rural and regional Queensland. The development follows a rigorous process and the need for guidelines is determined by clinicians at Statewide Maternity and Neonatal Clinical Network forums and by the Queensland Clinical Guidelines Steering Committee.

QCG is committed to completing each guideline within approximately 26 weeks. This may be extended when a guideline is complex or lacking in compelling evidence making a consensus view difficult to reach. The process for development was endorsed by Queensland Health, Patient Safety and Quality Executive Committee in 2009.

Following consensus of agreement on the need for a guideline a first draft is prepared. Clinical leads are appointed to oversee and advise on current best practice and provide direction. A working party is established with members from multidisciplinary backgrounds from public and private sector health care facilities. Consumers are also included in the working party. The refined draft guideline is circulated for three rounds of consultation to the working party, clinicians across the state before a draft is prepared for final consultation. The document is endorsed prior to publication on the QCG website. Education on use of the guideline is provided via video conference with a knowledge assessment offered to assist clinicians. An audit tool is used to assess the effectiveness and implementation of each guideline.

With long standing discussion on management of Gestational diabetes mellitus (GDM) and changes to the diagnostic criteria for (GDM), there have been many requests for the development of a QCG guideline for diagnosis and management of GDM. QCG began this process in October 2014. Clinical leads were appointed and there was overwhelming interest for working party membership. The development has followed the QCG process and the guideline is a comprehensive document covering testing and diagnosis of GDM and all aspects of care. There was significant feedback on blood glucose treatment targets and antenatal breast milk expression for women with diabetes and pregnancy.

Endorsement is scheduled for July, 2015.

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Observational audit of neonatal admissions to Special Care Nursery for hypoglycaemia in women with diabetes in pregnancy

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Pre-existing and Gestational Diabetes are associated with pre-term birth, caesarean section and neonatal admission to special care nursery (SCN) (1). Management of diabetes in pregnancy (DIP) and neonatal outcomes have been researched (2). Intra-partum intravenous insulin infusion was associated with improved neonatal outcomes in women with Type 1 Diabetes twenty-five years ago (3), but overall evidence regarding intra-partum glucose targets, monitoring, and management is poor, and other (less laborious) strategies, such as subcutaneous fast acting human analogue insulins, are possible. Our policy is for two-hourly capillary glucose monitoring throughout established labour and subcutaneous fast acting human analogue insulin for glucose readings greater than 5.5 mmol/L titrated according to the insulin requirements in pregnancy.

We audited the records of mothers with DIP who delivered at Bendigo Health from January 2012 to March 2015. Gestational diabetes was diagnosed and managed using the WHO criteria (pre-July 2014) or IADPSG criteria. Requirement for neonatal admission to the SCN was assessed with respect to the insulin use during labour.

Of 375 mothers with DIP (347 GDM; 13 T1DM; 12 T2DM; 3 unknown), 27 received additional subcutaneous intra-partum insulin and 2 neonates experienced post-partum hypoglycemia, with one requiring admission to the SCN (3% admission rate). However, in total, 41 neonates experienced hypoglycaemia and 29 required SCN admission (18 pure hypoglycaemia; 11 hypoglycaemia and another associated problem - 8% admission rate).

Thus, two questions are posed: firstly is the target of intra-partum glucose of less than 5.5 mmol/L low enough to prevent neonatal hypoglycaemia; secondly are the outcomes the same for intravenous versus subcutaneous insulin? Of note, even if intravenous insulin was used in our Policy it would not have been given a number of the mothers with infants admitted to SCN for hypoglycaemia. Future research hopes to draw a comparison of these results with another major regional centre that uses an insulin infusion policy during labour.

1. AIHW 2010. Diabetes in pregnancy: its impact on Australian women and their babies. Diabetes series no. 14. Canberra: AIHW. Cat. No. CVD 52.
2. Hartling L, Dryden DM, Guthrie A, et al. Benefits and harms of treating gestational diabetes mellitus: a systematic review and meta-analysis for the U.S. Preventive Services Task Force and the National Institutes of Health Office of Medical Applications of Research. Ann Intern Med 2013; 159:123.
3. Jovanovic L, Peterson CM. Management of the pregnant, insulin-dependent diabetic woman. Diabetes Care 1980; 3:63.

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Greater than a four-fold risk of progression from gestational diabetes to type 2 diabetes among Indigenous women, compared to non-Indigenous women, in Far North Queensland, Australia

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Background:

Gestational Diabetes Mellitus (GDM), defined as diabetes in pregnancy, is increasing in prevalence. GDM causes serious complications in pregnancy and birth, and women diagnosed with GDM have a very high risk of developing Type 2 Diabetes Mellitus (T2DM) postpartum. If left undetected and untreated, T2DM can cause serious complications in subsequent pregnancies, and in the longer term for the mother. While studies have shown that Indigenous women in Canada, New Zealand, and the United States have higher rates of GDM, and faster rates of progression from GDM to T2DM than non-Indigenous women in the same country, there have been no studies reporting rates of progression from GDM to T2DM among Indigenous women in Australia.

Methods:

We conducted a retrospective cohort study using linked electronic data validated by medical record reviews, to investigate postpartum care and diagnosis of T2DM among all women diagnosed with GDM who gave birth at Cairns Hospital from 2004 to 2010.

Results:

Indigenous women had more than a 4-fold risk of developing T2DM after GDM compared to non-Indigenous women (HR 4.55, 95% confidence interval 2.63-7.88, p=<0.0001). By three years, five years, and seven years postpartum, 21.91% (15.77-29.99%), 25.45% (18.59-34.26%), and 42.44% (29.63-58.03%) Indigenous women were diagnosed with T2DM after GDM respectively; compared to 4.23% (2.47- 7.19%), 5.65% (3.33-9.53%), and 13.46% (7.28-24.15%) non-Indigenous women.

In multivariate analysis there was an increased rate of T2DM progression seen among women with a pre-pregnancy body mass index >25, and who only partially breastfed at discharge from hospital.

Conclusion:

Indigenous women have a greater than four-fold risk of developing T2DM after GDM, compared to non-Indigenous women in Australia.

Strategies to reduce risks of T2DM progression by supporting a healthy weight and breastfeeding, and to improve postpartum care and screening among Indigenous women with GDM are urgently needed.

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Birth outcomes in women with diet managed gestational diabetes: The PANDORA Study

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Outcomes of those with gestational diabetes (GDM) compared to the general population have been well described. However, there is little evidence on the characteristics and birth outcomes of those with GDM managed by diet alone. The PANDORA study is a longitudinal birth cohort study recruited from a diabetes in pregnancy (DIP) register. Here we compare the demographics and birth outcomes of Northern Territory (NT) women with diet-managed GDM and those without DIP.

All NT women with DIP aged 16 years and over are eligible for PANDORA. Information collected included antenatal and birth information, cord blood, and neonatal anthropometry. Data on NT women without DIP were provided by NT Midwives' Collection. Results of 197 women with diet-managed GDM and their babies born to July 2014 were reported and compared to 3405 women without DIP who birthed in the NT in 2012. Data were analysed using t-tests, chi-squared tests; multivariate linear and logistic regression.

Differences between women with diet-managed GDM (n=197) and women without DIP were evident for age (mean age 31.0 vs. 28.1 years), and Aboriginal/Torres Strait Islander ethnicity (24.4% vs. 32.5%, p=0.044). Induction of labour rates (43.2% vs. 22.5%, p<0.001), instrumental deliveries (13.7% vs. 8.6%, p=0.02) and planned caesarean sections (20.7% vs. 13.2%, p=0.038) were greater in those with diet-managed GDM. Post-partum haemorrhage (PPH) rates were similar between both groups (20.8% vs. 25.1%). There were no significant differences in newborn outcomes between the 2 groups for: gestational age (38.9 vs 38.6 weeks), mean birth weight (3222g vs 3298g) and Apgar scores (5 minute Apgar scores of 7-10, 98% vs. 97.1%).

The study shows higher rates of induction of labour, instrumental deliveries and planned caesarean sections among NT women with diet-managed GDM. There were no differences in newborn outcomes. Further studies are indicated to explore reasons for higher rates of induction of labour in those with diet-managed GDM; factors such as age and co-morbidities may play a role.

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The Hawke's Bay District Health Board's (HB DHB) GDM Healthy Lifestyles ProjectA project overview

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Introduction

In 2011 Sir Peter Gluckman, Chief Science Advisor to the New Zealand Prime Minister released a report (the Gluckman report) on the effects of maternal health and nutrition on foetal health and development. The HB DHB received funding for a 3-year period to develop support services to improve Maternal and Child Nutrition and Physical Activity (MINPA). The overall project consists of five components. This presentation will describe one component; the GDM Healthy Lifestyles Project.

Objectives

- Reduce the impact of unhealthy lifestyle in the preconception, antenatal and postnatal periods for childbearing women, and in the early years of life for their children
- Reduce the incidence and impact of GDM
- Target mothers <24 years, with focus on Maori, Pacific Island and those with a BMI >30 m²/kg

Methods

- Implement the NZ Ministry of Health's "Screening, diagnosis and management of GDM in NZ: A clinical practice guideline" released in December 2014
- Deliver the Healthy Lifestyles Package to women with GDM
- Target unhealthy weight pre-conception
- Support healthy gestational weight gain
- Support post-natal mothers to achieve and maintain healthy lifestyle choices
- Assist with the establishment and ongoing delivery of the Maternal Green Prescription (MGRx) programme provided by Sport Hawke's Bay

Results Just over two years into the project we are seeing 100% of women with diagnosed GDM for individualised dietary advice. Of the women who have delivered we have seen 64% for a 4-month post-partum diet and lifestyle review. We aim to discuss the MGRx with all women we see and so far we have referred 22 % to this service. We have developed a number of dietary resources to support the women we work with. In August we started delivering the workforce development component for both health professionals and non-clinical support workers.

Conclusions The MGRx component has recently been evaluated and the preliminary report indicates largely positive feedback. We have established a good working relationship with a number of stakeholders including the diabetes in pregnancy team. We are meeting our goal of seeing 100% of women with known GDM. We have delivered education sessions to the MGRx advisors and other stakeholders.

Audit of screening for gdm at booking before and after introduction of a risk factor checklist

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Background: Gestational Diabetes (GDM) is an increasingly prevalent condition with potential morbidity to mother and child. Current ADIPS guidelines recommend screening women at high-risk for GDM at presentation to antenatal services, followed by routine screening at 24-28 weeks gestation if initial screening is negative(1).

Aims: To [1] assess how well the ADIPS early GDM screening recommendation is followed and [2] to introduce, (and assess utility and acceptability of), a checklist to assist midwives by prompting adherence to best practice recommendations.

Methods: We assessed existing processes by undertaking a retrospective record audit of all women seen at the booking-in antenatal clinics during a one-week period in November 2014 in three large South Western Sydney Teaching Hospitals. We assessed how many women at high-risk for GDM were identified and whether they were referred for and received appropriate screening. We introduced a tick box 'GDM high-risk factor' checklist as a reminder to assist midwives and then re-audited the records of all women seen for a subsequent week in 2015. An anonymous questionnaire sought midwives' views on aspects of the checklist.

Results: The Table shows pooled audit results from the three hospitals before and after checklist use, and responses to a 1-5 Likert scale assessment of checklist acceptability. Specifically the percentage of women not being appropriately screened reduced by almost 6% (with the majority being referred for screening but many failing to attend the pathology test). There was also a drop in the number of women screened who did not meet high-risk criteria (10.1% to 5.8%).

Table 1

	Initial Audit Nov 2014	**Subsequent Audit Early 2015**
	n= (%)	n= (%)
Women seen (total)	166	172
Women correctly screened	70	90
Women NOT screened	29	20
% not screened	(17.5)	(11.6)
Women incorrectly screened	17	10
GDM found at early screening	17	9
Checklist acceptability*		Mean ± SD
Format	-	4.0 ± 1.5
Ease of Completion	-	4.5 ± 1.0
Time taken to complete	-	3.7 ± 1.5

*Likert Scale:
'1 Unclear/Difficult/Too Long' to '5 Clear/Easy/Not Excessive' respectively

Conclusions: These data show an improvement in screening following the introduction of a checklist reminder, with assessment of its acceptability being favourable overall in regards to its format, ease of use and time of complete. Nevertheless some women were still not screened and a number still incorrectly screened.

Acknowledgements: We thank all of the midwives who assisted with this study and completed questionnaires.

1. ADIPS GDM Guidelines [Accessed 2-4-2015]. http://adips.org/downloads/ADIPSConsensusGuidelinesGDM-03.05.13VersionACCEPTEDFINAL.pdf

Survey on testing for gdm in australia

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Background: Worldwide debate continues regarding adoption of International Association of Diabetes and Pregnancy Study Groups (IADPSG) Gestational Diabetes (GDM) diagnostic criteria(1), with many countries not adopting, or modifying the criteria in their recommendations.

Aim: As the Australasian Diabetes In Pregnancy Society (ADIPS) has adopted and recommended uptake in Australia(2), our aim was to ascertain the extent to which this has occurred.

Methods: An emailed questionnaire to all National Association of Diabetes Centres (NADC) Diabetes Centre members assessed whether they were involved in GDM management, and if so, whether they: (a) had adopted IADPSG criteria and guidelines (and when); (b) were still doing a 50g Glucose Challenge Test(GCT); (c) had instituted early GDM testing (and how); (d) had noted any change in workload.

Results: Of 96 NADC members, 3 stated no involvement with GDM and 31 returned questionnaires (35.4% response), with: (a) 23 having adopted IADPSG criteria (commencement 2012 to 4/2015) and 8 not; (b) none still doing a 50g GCT (n=28, 4 unanswered); (c) 25 having instituted early testing (6 unanswered), most risk factor driven (n=21) or 'ad hoc' (n=7) (both n=6), with n=3 'universal'. Early screening was reported as predominantly by oral glucose tolerance test (n=25), or either by fasting glucose (n=7), HbA1c (n=2), or random glucose (n=3) (several by multiple methods, n=5 unanswered); (d) the majority who have changed to IADPSG criteria reported workload increases of 5-200% [mean+SD 34+48%] (n=17), one reported a decrease, 5 responded 'too early to tell'. The Table shows respondents' details.

Table 1

Respondents	Number of NADC Centres n =	Not involved in GDM n =	Completed Surveys Received n =	Overall Response Rate %	IADPSG Criteria Adoption n=
NSW	29	1	12	44.8	7
Victoria	27	1	6	25.9	5
Queensland	20	1	4	25.0	4
Tasmania	3	-	3	100	3
Northern Territory	3	-	3	100	2
Australian Capital Territory	4	-	1	25	1
South Australia	6	-	1	16.7	0
Western Australia	4	-	1	25	1

Conclusions: These data suggest that ADIPS recommended changes to GDM diagnosis have been adopted in a piecemeal fashion, with cessation of GCT universal amongst respondents, early screening recommendation adoption common but by varied methodology, and IADPSG diagnostic criteria adoption far from complete with significant workload increases almost universal in those who have.

Acknowledgements: We thank the National Association of Diabetes Centres who emailed our questionnaire and a follow-up reminder to their members, and all those who responded.

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 hyperglycaemia in pregnancy. Diabetes Care 2010; 33: 676-682.
2. ADIPS GDM Guidelines [Accessed 2-4-2015]. http://adips.org/downloads/ADIPSConsensusGuidelinesGDM-03.05.13VersionACCEPTEDFINAL.pdf

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Metformin-Induced Vitamin B12 Deficiency in Gestational Diabetes

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Background--- Metformin is the first-line pharmacological therapy in type 2 diabetes mellitus, and is also used to manage gestational diabetes mellitus, as both disorders are characterised by increased insulin resistance.

Objective—

To audit all women with gestational diabetes mellitus (GDM) requiring treatment with metformin at a level 2 metropolitan hospital over a one year period to determine incidence of vitamin B12 deficiency.

Methods— This retrospective observational study of medical records identified all women who were diagnosed with gestational diabetes mellitus and their mode of treatment. All procedures were identified through hospital information systems and entered into a single database by trained physicians.

Results— During the study period, 423 women were diagnosed with GDM. Only a small proportion (34 women, 8%) had vitamin B12 levels performed during pregnancy; eight of which were performed early in pregnancy, prior to diagnosis of GDM, whom were excluded. 35% (12) of women with vitamin B12 levels required treatment with metformin. Surprisingly, 67% (8) of these women had normal vitamin B12 levels. Women requiring insulin treatment also demonstrated normal vitamin B12 levels in 75% (6). All women able to control their GDM with diet alone had vitamin B12 levels within normal limits(6).

Conclusions— Despite the controversy regarding mechanisms, chronic metformin use is a well-known causative factor of vitamin B12 deficiency. Given gestational diabetes is usually diagnosed between 26 and 28 weeks gestation, with many women requiring induction between 38-40 weeks, it is unlikely that this short-term use of metformin is responsible for similar biochemical deficiencies. Although vitamin B12 deficiency usually presents with haematological and neurological symptoms, these symptoms may be analogous with pregnancy, or potentially worsened by the increasing demands of pregnancy. Given vitamin B12 levels are not routinely screened antenatally, data was limited in our population. However, further data is being collected to determine its impact upon this population.

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Understanding Barriers and Facilitators to Postpartum Care among Aboriginal and Torres Strait Islander women with Gestational Diabetes: translating women's perspectives into informed action

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6. *Apunipima Cape York Health Council, Cairns North, Queensland, Australia*
7. *CQUniversity, Rockhampton, Queensland, Australia*
8. *Diabetes Queensland, Cairns North, Queensland, Australia*
9. *Cairns Diabetes Centre, Cairns North, Queensland , Australia*

Background:

Women with gestational diabetes have a very high risk of developing type 2 diabetes after pregnancy, and are therefore advised to have diabetes screening 1-2 yearly after pregnancy. However, we conducted an audit of all women who had gestational diabetes from 2004 to 2010 and gave birth at Cairns Hospital (Far North Queensland, Australia) and found very low rates of postpartum glucose screening for all women, but particularly among Aboriginal and Torres Strait Islander women, with the lowest rates seen among Aboriginal and Torres Strait Islander women living in the regional centre (Cairns). We do not have a clear understanding of the challenges or strategies to improve postpartum diabetes screening from the perspectives of Aboriginal and Torres Strait Islander women, and how these may be implemented.

Methods:

We are conducting a qualitative research translation study, involving a series of focus groups and interviews, in three incremental stages to:

1. Understand issues for Aboriginal and Torres Strait Islander women and ensure emergent strategies are grounded in women's perspectives (15-20 women)
2. Generate potential context-relevant strategies with Aboriginal and Torres Strait Islander Health Workers (15-20 health workers)
3. Refine and implement feasible strategies with other service providers

Aboriginal and Torres Strait islander women with gestational diabetes (living in urban and remote areas separately), to understand barriers and facilitators and identify helpful strategies (15-20 service providers)

This research is being conducted a majority of Indigenous researchers and analysed using content and discourse analysis.

Results:

The findings will be synthesized with the quantitative data to enable triangulation and contextualisation of findings. This demonstrates a systematic process for developing context-relevant strategies to improve the health of Aboriginal and Torres Strait Islander people.

We will discuss the lessons learned and outline the emergent strategy.

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Providing Diabetes Education services for Gestational Diabetes- A service model that continually evolves!

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With the increasing prevalence of Gestational Diabetes service provision needs to be delivered in a way that is efficient, accessible and cost effective while not compromising quality, clinical risk and evidence based outcomes. The Northern Adelaide Local Health Network (NALHN) Diabetes Education Service has had to re-think service provision to cope with increasing demand. In 1991 there were 58 women referred with gestational diabetes compared to 111 in 2006. The women were seen individually by the diabetes educator and dietitian for education, phoned weekly with their blood glucose levels and were seen once a fortnight by a diabetes educator. In 2006 the Diabetes Education service commenced weekly group education due to difficulty with access to appointments. This weekly group education model was categorised as a Day Admission. 50 women with gestational diabetes commenced insulin therapy in 2006 were seen in the general Endocrine clinics. The Diabetes Antenatal Clinic commenced in 2008 which was staffed by the Endocrine Registrar. In 2013/2014 there were 328 women referred for gestational diabetes and 219 used the group education program. Women contact the stabilisation service once a week. The Diabetes Antenatal Clinic has evolved over time to a multidisciplinary service. Activity in the Diabetes Antenatal Clinic has increased from 119 in 2008 to 701 in 2013/2014 and in 2013/2014 165 women commenced insulin. In 2009 Diabetes Education also developed an Insulin Adjustment Clinic for women who are culturally and linguistically diverse allowing weekly reviews of blood glucose levels. In 2013/2014 there were 359 occasions of service in the Insulin Adjustment Clinic compared to 113 in 2009. Diabetes Education has collected patient satisfaction surveys since 2006 to continually improve the service. In 2006 32 surveys were collected compared to 137 in 2014. In 2015 the new ADIPS diagnostic criteria will be adopted which will commence the NALHN Diabetes Education service through another challenging journey to cope with the potential increase in diagnosis and commencement of medication therapy.

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A retrospective study comparing antenatal characteristics and obstetric outcomes of South-East Asian and Caucasian women with gestational diabetes

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Background: Women of South East Asian (SEA) background are at increased risk of developing gestational diabetes (GDM) compared with Caucasians despite lower body mass index (BMI)[1]. We hypothesise that the combination of obesity and GDM observed in Caucasian populations may increase the treatment demands in GDM and potentially worsen obstetric outcomes as compared to their SEA counterparts with lower BMIs. This retrospective study aims to compare antenatal characteristics, diabetes treatment and obstetric outcomes of SEA and Caucasian women diagnosed with GDM.

Methods: 50 SEA and 50 Caucasian women diagnosed with GDM between 26-28 weeks gestation during 2012-2013 were studied. Information collected included antenatal, diabetes treatment and birth information. Data was analysed using t-tests, chi-squared tests and Pearson's correlations.

Results: Compared to SEA women with GDM, Caucasian women with GDM had a significantly higher BMI (Caucasian vs. SEA, 28.8 vs. 23.4 kg/m^2, $p<0.001$) and were more likely to be overweight (40 vs. 6%, $p<0.001$). There was no difference in age (30.4 vs. 32.3, $p=0.07$) between the 2 groups. OGTT results were significantly different between groups; median fasting plasma glucose (FPG) was higher (4.7 vs. 4.5 mmol/L, $p=0.03$) and 2-hour plasma glucose (2hPG) was lower in Caucasian women (8.4 vs. 8.9 mmol/L, $p=0.007$). There were no significant differences in the proportion of women requiring insulin (46 vs. 38%, $p=0.41$), gestation when insulin was commenced (31 vs. 30 weeks, $p=0.63$) or end-gestation total daily insulin dose (16 vs.14 units, $p=0.35$). There were no differences between Caucasian and SEA women for outcomes: elective caesarean (24 vs. 8%, $p=0.11$), emergency caesarean (16% vs. 26%, $p=0.11$) and birth weight (3487 vs. 3478g, $p=0.62$). There was a significant positive correlation between BMI and FPG ($r=0.43$, $p<0.0001$) and a non-significant negative correlation between BMI and 2hPG ($r=-0.11$, $p=0.26$).

Conclusion: Caucasian women had a higher BMI, higher FPG and lower 2hPG compared to SEA women with GDM with no significant differences observed in diabetes treatment and obstetric outcomes between the 2 groups. FPG positively correlated with BMI but 2hPG does not.

1. Retnakaran, R., et al., Ethnicity modifies the effect of obesity on insulin resistance in pregnancy: a comparison of Asian, South Asian, and Caucasian women. J Clin Endocrinol Metab, 2006. 91(1): p. 93-7.

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When does fetal cardiotocography add value to the antenatal management of pregnancy complicated by gestational diabetes mellitus: a prospective audit?

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Background: Controversy surrounds the role of fetal cardiotocography (CTG) in the antenatal monitoring of pregnancy complicated by gestational diabetes mellitus (GDM).[1 2]

Aims: To investigate the number of antenatal CTGs that need to be performed (NNT) in pregnancy complicated by GDM and the cost per episode of definitive change in management (DCM).

Materials and Methods: A prospective audit of all women who delivered from 1st July 2010 to 30 June 2014 at Joondalup Health Campus, from predefined referral postcodes within the North Metropolitan Health Service who were diagnosed with GDM. Outcomes for all antenatal CTGs were audited to determine the NNT and cost per DCM.

Results: Of 10,296 women, 349 were diagnosed with GDM and these women underwent 1404 antenatal CTGs (4.02 per woman). In women with GDM requiring Insulin or Metformin therapy in addition to diet, the NNT=43 and cost per episode of DCM was $2118.80 to $3036.92. In women with diet controlled GDM with a secondary pregnancy complication, the NNT=161 and the DCM cost was $8063.44. In women with diet controlled GDM without a secondary complication, use of CTG did not alter management (NNT>445 and DCM cost >$21279.90).

Conclusion: CTGs might be safely omitted in diet controlled GDM pregnancy with no secondary complications. In women requiring combination therapy, antenatal CTG surveillance might provide valuable information on fetal wellbeing.

1. The American College of Obstetricians and Gynecologists. Practice Bulletin No. 137: Gestational Diabetes Mellitus. Obstetrics & Gynecology. 2013 Aug; 122(2): 406-416.
2. Loomis L, Lee J, Tweed E. What is appropriate fetal surveillance for women with diet-controlled gestational diabetes?. Journal of Family Practice. 2006; 55(3): 238-240.

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Ethnic differences in insulin use during pregnancy in women with pre-gestational type 2 diabetes

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Background: Differences in insulin resistance and β-cell function have been postulated for the increased susceptibility of type 2 diabetes amongst some ethnicities.[1] However there is limited data on whether this difference alters insulin requirements across ethnicities, especially in pregnancy where increases in insulin resistance triggers commencement and rapid escalation of insulin dose to maintain euglycemia.

Aim: To determine whether there is a difference in peak total insulin dose (TID) and the relative composition of prandial and basal insulin across ethnicities in the management of women with pre-gestational type 2 diabetes in pregnancy.

Method: A cross-sectional study of 126 pregnant women, with pre-gestational type 2 diabetes treated with insulin, was conducted at two tertiary referral centres in Western Sydney. Comparison across 4 ethnicities was performed via analysis of variance of weight adjusted peak TID during pregnancy (units/Kg), basal and prandial components (calculated as percentage of peak TID) and 3rd trimester HbA1c. Metformin use was included in multivariate analysis of insulin requirement.

Result: The 126 participants consisted of 37(29.4%) Caucasian, 48(38.1%) South Asian, 20(15.9%) Asian, and 21(16.7%) Middle-Eastern women. Between ethnicities, there was a significant difference in the proportion of prandial insulin contributing to the peak TID, (p=0.01). This significance was preserved after adjusting for Metformin use, (p=0.009). The proportion of prandial insulin was 13% (95% CI 3-23), higher in South Asian women compared to Caucasians (67% vs 54%), and 19% (95% CI 6–31) higher in Middle-Eastern women than Caucasians (73% vs 54%). There was no significant difference in the peak TID (units/Kg) during pregnancy across the ethnicities (p=0.289). Third trimester HbA1c was similar across ethnicities (p=0.183) allowing for valid comparison of insulin requirements.

Conclusion: Our data provides important insights on ethnic differences in insulin requirements in pregnant women with pre-gestational type 2 diabetes. Women of South Asian and Middle Eastern background appear to require greater proportions of prandial insulin during pregnancy compared to Caucasians. Further study is needed to elicit whether this ethnic difference in prandial insulin is attributable to diet or β-cell response.

1. Chiu, Ken C., et al. "Insulin sensitivity differs among ethnic groups with a compensatory response in beta-cell function." Diabetes Care 23.9 (2000): 1353-1358

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Pre-delivery maternal glycaemic control and the risk of neonatal hypoglycaemia in women with pre-gestational diabetes mellitus

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Background: Neonatal hypoglycaemia in diabetic pregnancy is postulated to be due to fetal hyperinsulinaemia as a consequence of exposure to maternal hyperglycaemia during pregnancy. Therefore it is standard practice to maintain tight glucose control with an insulin-glucose infusion during labour. However, there is little literature to support the benefit of tight glucose control at this late stage of pregnancy

Aim: To determine of the relationship between pre-delivery glycaemic control and neonatal hyperglycaemia in women with pre-gestational diabetes .

Methods: A retrospective medical record review of women with pre-gestational diabetes managed with insulin in pregnancy was conducted. Parameters related to glucose control, insulin administration, and pregnancy outcome were collected. Neonatal hypoglycaemia was defined as serum glucose ≤2.5mmol/L.

Results: Ninety seven women were included in the study. The mean 3rd trimester HbA1c was 6.5±0.1%). The mean BGL in the 24hours prior to delivery was 6.0±0.2 mmol/L. On univariate analysis, the significant risk factors for neonatal hypoglycaemia were 3rd trimester HbA1c (β=0.498, Odds Ratio=1.65, 95%CI 1.027–2.637, p=0.038), preterm delivery<36 weeks gestation (β=1.79, OR=6, 95% CI 1.65–21.8, p=0.006), large or small for gestational age (β=1.14, OR=3.13, 95%CI 1.23–7.96, p=0.017). Women on >6hours of insulin-dextrose infusion during delivery (n=26, 27%) had decreased risk of neonatal hypoglycaemia (β=-0.94, OR=0.39, 95%CI 0.16–0.99, p=0.048). The peak, mean, standard deviation and final BGL in the last 24hours of delivery were not significantly associated with neonatal hypoglycaemia. On multivariate analysis, preterm labour was the only significant independent risk factor (β=1.64, OR=5.17, 95%CI 1.05–25.49, p=0.043). However there was an inverse relationship between the trough neonatal BGL with 3rd trimester HbA1c (β=-0.262, 95%CI -0.099 to -0.424, p=0.002) and last maternal BGL before delivery (β=-0.103, 95%CI -0.020 to -0.186, p=0.015).

Conclusion: 3rd trimester HbA1c, but not measures of glycaemic control in the 24 hours prior to delivery, was associated with neonatal hypoglyceamia. However the inverse relationship between the trough neonatal BGL with last delivery BGL and the negative relationship between insulin infusion and neonatal hypoglycaemia suggests that insulin dextrose infusion in labour may still be of benefit, other than for the prevention of DKA.

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Maternal Characteristics of Pregnant Women with Type 1 and Type 2 Diabetes: A Single Centre Retrospective Analysis

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Introduction:

Despite differences in overall glycaemic control between Type 1 (T1DM) and Type 2 diabetes (T2DM), similar adverse obstetric outcomes have consistently been reported. We conducted a 10-year retrospective study to explore the characteristics of women with T1DM and T2DM at a single tertiary obstetric hospital in Melbourne.

Methods:

Clinical and biochemical characteristics of women with T1DM (n=93) and T2DM (n=106) between 2004-2014 were recorded. Group comparisons were performed using Chi-square tests and Mann-Whitney U test. The following major obstetric outcomes were assessed: pre-eclampsia, pregnancy induced hypertension, preterm premature rupture of membranes, pre-term birth, large for gestational age, small for gestational age, neonatal jaundice requiring phototherapy, neonatal hypoglycaemia, Apgar score < 5 at 5 mins, neonatal intensive care admission and fetal death. Maternal estimated glomerular filtration rate (eGFR) was calculated using the Chronic Kidney Disease Epidemiology Cohort formula.

Results:

There was no major pregnancy outcome difference apart from mean birth weight gestational centile, which was higher in T1DM (84.8 ± 24.8 vs. 64.4 ± 34.1, p=0.001) In addition, T1DM women had a higher proportion of large for gestational age >90th centile babies (64.5% vs. 35.8%, p=0.001)

Table 1 Maternal characteristics in women with Type 1 and Type 2 diabetes at baseline

	Type 1 Diabetes	Type 2 Diabetes	p-value
n	93	106	
Age (years)	31 ± 4.5	34 ± 5.2	0.001
BMI (kg/m^2)	28.3 ± 6.5	34.9 ± 10.4	0.001
Parity	1 ± 0.83	1 ± 1.23	0.2
Smoking status at conception			
Current smoker	7(7.5)	6(5.7)	0.8
Ex-smoker	9(9.7)	11 (10.4)	
Non-smoker	77 (82.8)	89 (84)	
Duration of diabetes (years)	12.3 ± 7.9	3.9 ± 2.7	0.001
HbA1c (%)	7.5 ± 1.6	7.0 ± 1.4	0.03
Systolic blood pressure (mmHg)	116 ± 11	120 ± 14	0.02
Diastolic blood pressure (mmHg)	69 ± 8.3	73 ± 9	0.02
Serum creatinine (mmol/l)	54 ± 11.0	48 ± 18.3	0.001
CKD-EPI eGFR (ml/min/1.73m^2)	120 ± 13.5	124 ± 15.9	0.02
ACR (mg/mmol)*	1.6 ×/÷ 6.9	1.9 ×/÷ 4.5	0.2
Normoalbuminuria	41 (77.3)	33 (82.5)	0.5
Microalbuminuria	9 (17.0)	4 (10.0)	
Macroalbuminuria	3 (5.7)	3(7.5)	
Pre-existing hypertension	10(10.8)	23 (21.7)	0.04
RAAS blocker at conception	8 (8.6)	8 (7.5)	0.8
Statins therapy at conception	4 (4.3)	9 (8.5)	0.2
Microvascular complications	21 (22.6)	8 (7.5)	0.003
Macrovascular complications	2 (2.2)	0	0.1

Data expressed mean ± SD or n (%) or geometric mean ×/÷ tolerance factor

*First trimester ACR were available for 53/93 (57%) women with Type 1 and 40/106 (38%) women with Type 2 diabetes

Women with T2DM had more advanced maternal age, higher BMI and pre-existing hypertension. Antenatal use of antihypertensive medication was higher in women in T2DM (19.8% vs 8.6%, p=0.025).

Duration of diabetes and prevalence of microvascular complications was higher in the T1DM group (Table 1). Across all three trimesters, women with T1DM had higher glycosylated haemoglobin (HbA1C), lower blood pressure, higher serum creatinine, and corresponding lower renal function reflected by eGFR.

Conclusion:

In this population, maternal T1 diabetes was characterised by overall poorer glucose control, more retinopathy, longer diabetes duration and reduced GFR. Maternal T2 DM was characterised by increased age, higher BMI, and both more pre-existing hypertension. This data shows that in a cohort of maternal pre-existing diabetes, despite the recognised similarities between Type 1 & 2 diabetes, these medical conditions are also characterised by individual adverse pregnancy risk profiles.

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Seven secrets to successful postnatal GDM follow-up

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Background: Australian and international clinical practice guidelines recommend that women diagnosed with gestational diabetes mellitus (GDM) complete post-delivery follow-up screening. Perplexingly completion rates remain low worldwide. Why mothers fail to complete recommended follow-up screening after a pregnancy complicated by GDM is not well understood. However the quality of health communication between clinicians in different settings and their patients is implicated.

Aims: To triangulate the findings from three separate studies focused on different aspects of GDM follow-up to determine strategies that may promote completion of postnatal GDM follow-up.

Method: Three studies were undertaken. Study one involved interviews with women diagnosed with GDM (n=13) and their clinicians in hospital (n=13) and GP (n=16). Study two was a retrospective chart audit of the discharge summaries of women diagnosed with GDM (n=86) who gave birth during the period of 1 December 2012–28 February 2013 at a major maternity hospital in Australia. The final study was survey of clinician's preferences for maternity discharge summaries, in Queensland Australia. Two hundred and seventeen people responded to the survey invitation; eight were excluded, leaving 209 respondents. Demographic information was provided by 134 respondents, who were classified as GPs (n = 30), hospital doctors (Med) (n = 30) and hospital nurses and midwives (MID) (n = 74).

Results: Seven practical recommendations are identified from the three studies: The first, women should be provided with written information about what GDM means at the time of their diagnosis. 2) Clinicians should continue to discuss the need for GDM follow-up following the birth; 3) Women should be advised to book a double postnatal appointment to ensure adequate time for GDM follow-up; 4) Hospital discharge summaries should be made for all women with GDM; 5) Women should be given a copy of their discharge summary. 6) Discharge summaries should include information about a woman's GDM diagnosis; 7) Plans and advice for postnatal GDM care should be prioritised at the beginning of the discharge summary.

Implications: This research has resulted in a series of practical recommendations that may promote completion of recommended GDM postnatal follow-up.

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An Audit of the Quality of Discharge Summaries in supporting follow-up for Women with Gestational Diabetes Mellitus.

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Abstract

Background: Discharge summaries report the care provided in hospital and detail plans for postnatal follow-up. Women diagnosed with gestational diabetes mellitus (GDM) require additional follow-up and this information should be included in the discharge summary.

Aim: To determine the type and quality of written information about recommended postnatal follow-up in the hospital discharge summaries of women diagnosed with GDM.

Methods: A retrospective chart audit of discharge summaries was conducted for women diagnosed with GDM, who gave birth during the period of 1 December 2012–28 February 2013 at a major maternity hospital in Australia.

Results: Ninety-three percent (79 of 85) of women in the study had a discharge summary for their birth episode of care. Women's GDM diagnoses were identified in 89% (70 of 79) of the discharge summaries. In 93% (65 of 70) of these, the GDM diagnosis was on the last page. The need for GDM follow-up was identified in 15% of cases (11 of 79). None of the discharge summaries included complete or explicit recommended test information for GDM follow-up, as detailed in best practice recommendations.

Conclusions: In this study, maternity discharge summaries rarely provided adequate information for clinicians providing postnatal care for women with GDM. Overall, GDM diagnosis was well recorded, but detailed testing recommendations to facilitate ordering of screening tests were not included.

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Hospital Postnatal Discharge Summaries for Women with Gestational Diabetes: A Survey of Clinician Preferences

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Background: The maternity discharge summary is critical in the transition from hospital-based care to community care. Nevertheless, research is lacking about clinicians' perspectives on what summaries should include and look like.

Aims: To investigate the views of hospital clinicians and general practitioners (GPs) regarding the requirements for discharge summaries for women with GDM.

Methods: Two surveys were distributed via professional networks to maternity care clinicians (hospital or general practice) in Queensland, Australia. Questionnaires explored clinicians' views of the importance and preferred level of clinical information, as well as details necessary for GDM follow-up.

Results: Two hundred and seventeen people responded to the survey invitation; eight were excluded, leaving 209 respondents. Demographic information was provided by 134 respondents, who were classified as GPs (n = 30), hospital doctors (Med) (n = 30) and hospital nurses and midwives (MID) (n = 74). Participants rated the importance of the discharge summary on a five-point Likert scale. Significant differences were observed between GPs and hospital clinicians about the importance of the discharge summary (p =0.008), with hospital-clinicians judging the summary as more important for postnatal care than GPs. Further differences indicated that GPs preferred less detailed information when there was an intrapartum complication (CI 0.1280–0.53200.1280–0.5320, p =0.0003) and for long-term GDM management (GP vs Med, CI 0.02898–0.5110, p =0.0220; GP vs MID, CI 0.1580–0.56200.1580–0.5620, p = 0.0001) and management of future pregnancies (CI 0.0579–0.4620, p = 0.0062). Respondents otherwise agreed that more detailed information was better for complicated cases, and that less detailed information was preferable for uncomplicated cases. More than 96% of clinicians were aware of the need for postnatal GDM follow-up. Ninety percent (n = 27) of Med, 80% (n = 24) of GPs and 74% (n = 53) of Mid were confident in ordering GDM follow-up. No respondents provided comprehensive GDM follow-up advice according to the best practice guidelines.

Conclusions: Clinicians agree about the importance and overall detail required in the discharge summary. The need for postnatal GDM follow-up is almost universally understood, but does not extend to the details of recommended follow-up screening tests.

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Preconception Care for Women with Type 2 Diabetes in the Northern Territory- A Survey of Practitioners

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Background:

Pre-existing diabetes in pregnancy (DIP) can result in a range of complications, typically proportional to peri-conceptual glycaemic control[1-3]. High rates of pre-existing type 2 diabetes (DM2) in the Northern Territory (NT) highlight the need for provision of preconception care to improve the health of women and their children. This research –part of the NHMRC NT DIP Partnership- examines current preconception care delivery and associated barriers[4].

Methods:

A cross-sectional survey of health practitioners across disciplines and regions in the NT who self-identified as caring for women with DM2. The primary objective was to outline the practitioner type, practice setting and the nature and quality of pre-conception care, as benchmarked against the CARPA Women's Business Manual. Secondary objectives focused on qualitative experiences of the limitations and barriers to undertaking preconception care in the NT.

Results/Discussion:

Rural/remote practitioners were more likely to regard preconception care provision as feasible (67% Central Australian and 86% Top End) relative to urban practitioners (47% Central, 62% Top End). The majority of respondents (73%) utilise CARPA guidelines and 53% undertake opportunistic preconception or contraception counselling.

Most respondents addressed lifestyle modification: 90% discuss smoking cessation, 85% explain the effects of smoking on pregnancy, 82% discuss weight loss and only 4% reported not being comfortable having this discussion. With regard to medication changes peri-conception: 44% prescribe the correct folic acid dose and 40% commenced iodine supplementation; 80% continue metformin and 93% cease ACE Inhibitors. However, this data excludes almost half of respondents who felt medication adjustment was not within their role. Themes regarding barriers to preconception care provision included transient workforce, language/cultural barriers and unplanned pregnancies with late presentation.

Conclusions:

Most practitioners recognised the CARPA preconception care guidelines and adhered to recommendations regarding lifestyle modification. There appears to be potential for provision of preconception care, particularly in remote and regional settings, however, education surrounding medication management would be of benefit.

1. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, Hadden DR, McCance DR, Hod M, McIntyre HD, Oats JJ, Persson B, Rogers MS, Sacks DA. Hyperglycemia and adverse pregnancy outcomes HAPO Study Cooperative Research Group. N Engl J Med. 2008;358:1991–2002
2. Macintosh MC, Fleming KM, Bailey JA, Doyle P, Modder J, Acolet D, Golightly S, Miller A. Perinatal Mortality and congenital anomalies in babies of women with type 1 or type2 diabetes in England, Wales, and Northern Ireland: population based study. BMJ. 2006; 333 (7560):177-183
3. Gunton, J. E., et al. (2000). "Outcome of pregnancies complicated by pre-gestational diabetes mellitus." Aust N Z J Obstet Gynaecol 40(1): 38-43.
4. Maple-Brown, L., Brown, A., Lee, I-L., Connors, C., Oats, J., McIntyre, H.D., et al. (2013) Pregnancy and Neonatal Diabetes Outcomes in Remote Australia (PANDORA) study. BMC Pregnancy & Childbirth, 13-221

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Impact of the New IADPSG Gestational Diabetes Diagnostic Criteria on Pregnancy Outcomes in Western Australia

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Publish consent withheld

1. Hoffman L, Nolan C, Wilson JD, et al. Gestational diabetes mellitus--management guidelines. The Australasian Diabetes in Pregnancy Society. Med J Aust. 1998; 169: 93-7.
2. Metzger BE, Lowe LP, Dyer AR, et al. Hyperglycemia and adverse pregnancy outcomes. New Engl J Med. 2008; 358: 1991-2002.
3. 2 Metzger BE, Gabbe SG, Persson B, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diab Care. 2010; 33: 676-82.
4. 4 Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy: a World Health Organization Guideline. Diabetes Res Clin Pract. 2014;103:341-63.

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A dozen years of diabetes in pregnancy: public health implications

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Introduction/Aim: Gestional diabetes(GDM) rates predict the future burden of Type 2 diabetes. We determine rates of diabetes in pregnancy over 12 years, comparing annual incidence, and its increment, across different ethnicities, using country of birth as a surrogate. Factors associated with the rise are explored.

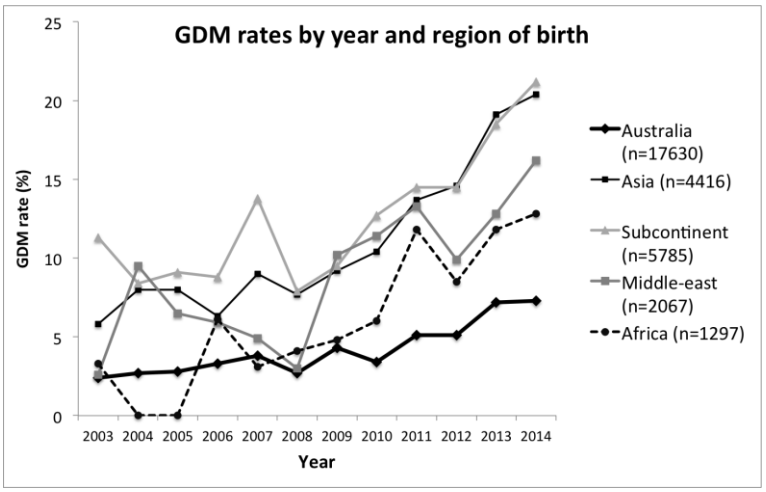
Methods: All pregnancies delivered at our institution from 2003-2014 were identified using local ObstetriX data. Maternal age, parity, booking-in BMI, country of birth, family history of diabetes, previous GDM, multiple pregnancy and smoking status were determined. Diabetes status in pregnancy was verified using a departmental GDM database. Binary logistic regression with backward-stepwise elimination identified independent predictors of GDM.

Results: 35829 pregnancies from 2003-2014 were analysed. GDM incidence rose from 3.5% to 13.2% in this time. While Type 1 rates remained stable at <0.2%, Type 2 rates increased from 0.2% to 0.8% over 12 years. Figure 1 demonstrates changing GDM rates according to maternal birth region.

Further analysis was restricted to 27831women born in Australia, Asia or the Indian-Subcontinent. Maternal age increased from 27.9 to 29.1 over 12 years. Mean BMI increased from 25.8 to 26.7 kg/m^2. Whilst the proportion of Asian-born remained stable (15%), falling proportions of Australian-born women (74% to 54%) are mirrored by a 20% increase in Subcontinental-born.

After adjustment, independent positive predictors of GDM included being Asian-born (OR 2.8 relative to Australian-born, p<0.001), Subcontinental-born (OR 3.3, p<0.001), calendar year (OR 1.1, p<0.001), maternal age (OR 1.1 for each year, p=<0.001), BMI (OR 1.1 per kg/m2, p<0.001), positive family history of diabetes (OR 1.5, p<0.001) and previous GDM (OR 8.2, P<0.001). Interestingly, smoking was an independent negative predictor of GDM (OR 0.24, p=0.02). As parity data was missing in 27%, it was not included in the model. From 2008-2014, parity declined from mean 1.48 to 1.39 (p=0.045, Kruskall-Wallis), suggesting it is unlikely to be driving GDM rates.

Conclusion: Increasing GDM incidence across all groups, combined with greater proportions of higher-risk ethnicities, signal an explosion of Type 2 diabetes in this area. As recently-arrived migrants disperse from initial settlement areas, wider geographic effects are predicted. Prevention strategies and health care preparedness are essential.



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Development of a Resource Model to Support Inpatient Care for Women with Diabetes in Pregnancy at Counties Manukau Health Auckland New Zealand

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The Diabetes in Pregnancy Service at Counties Manukau Health (CMH) provides an outpatient multidisciplinary service consisting of Physicians, Obstetricians, Midwives and Dieticians. On the diagnosis of Diabetes in Pregnancy the women are invited to attend a group education session with the midwife and dietician to initiate capillary blood glucose monitoring. Subsequent diabetes appointments occur with the rest of the multi disciplinary team and primary care is provided by the woman's primary care midwife or the diabetes in pregnancy midwife.

The increasing number of referrals to the service has resulted in the number of women admitted for inpatient care on the maternity ward, for either antenatal complications or postnatal care. It had been observed through incident reporting that issues in relation to the women's diabetes care had been missed or incorrectly administered.

The diabetes midwives met with the senior midwives in the inpatient area. The issues identified were often in relation to a gap in knowledge or staff being unaware of processes. Potential solutions were identified and will be illustrated in this poster presentation including development of a ward diabetes resource Nurse/Midwife, a diabetes eLearning module for all staff, compulsory annual update to include a session on diabetes processes and guidelines at CMH and orientation of all new staff to include a session by the diabetes midwives.

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A retrospective analysis of the relationship between ethnicity, body mass index and the diagnosis of gestational diabetes in women attending an Australian antenatal clinic.

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Background: Gestational diabetes (GDM) is increasing in prevalence. Prevalence and risk factors may vary with ethnicity. Australia's multi-ethnic population makes it important to understand these differences when designing local services. This study aims to determine GDM prevalence in a multi-ethnic population and assess the effect of ethnicity and body mass index (BMI) on GDM prevalence.

Methods: A retrospective study including 5260 pregnant women attending Sunshine Hospital between July 2012 and June 2013. The contributions of ethnicity, age, BMI and parity to predicting GDM were modelled using multivariable logistic regression.

Results: Women with pre-gestational/existing GDM at time of referral and cases with missing data were excluded (259). GDM was diagnosed in 630 women (12.43%). Mean age was 29.46 (SD=5.37), median parity was 1.01 (IQR=0-1). Women from East Asia were most likely to develop GDM (23.13%, ±95%CI=6.53; ANZ 8.77%, ±95%CI=1.23) followed by women of other Asian descent. The strongest predictors of GDM diagnosis were East Asian ethnicity (OR=5.71, 95%CI 2.89-11.29, p<0.001), followed by South Asian and South East Asian ethnicity and morbid obesity (OR=3.04, 95%CI 2.26-4.09, p<0.001).

Conclusions: There are clear ethnic differences in the prevalence of GDM. These data provide further support for the inclusion of ethnicity in GDM screening and management policies.

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The relevance of dietetic input for weight management during pregnancy: a retrospective analysis

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There is strong scientific evidence highlighting the link between being overweight and obesity in pregnancy and negative pregnancy outcomes such as increased risk of gestational diabetes, pre-eclampsia and pre-term births. Trends indicate that women are still gaining excessive amounts of weight during their pregnancies. Consequently, they are at greater risk of longer term consequences such as further weight gain with subsequent pregnancies and the promotion of obesity and associated metabolic conditions later in life.
Objective
To determine if women who gained excess weight during pregnancy would have valued perinatal dietetic advice for weight management.
Method
Female clients who have had children and are currently seeking weight management advice undertook a qualitative telephone survey. The questionnaire explored pregnancy weight trends and the strategies women utilised throughout pregnancy to attempt to manage their weight. The women were also asked for their retrospective opinion if and how they would have valued from dietetic input during their pregnancies to better manage their weight during and after pregnancy. Survey responses were analysed thematically.
Results
Ninety per cent of women surveyed perceived that they gained excess weight during one or more of their pregnancies. The most common weight management interventions utilised to manage weight during pregnancy included increasing physical activity and reducing intake of treat foods. All women surveyed felt that they would have benefited from seeing a dietitian at the start of their pregnancy to help them manage their weight during pregnancy and also assist in achieving appropriate weight loss post pregnancy. The most common reason for not seeing a dietitian during pregnancy was women not considering it as an option.
Outcome
These results highlight the perceived benefit of seeing a dietitian during pregnancy. As a result of this study, it is recommended that clinicians consider referring pregnant women to a dietitian routinely for education once they fall pregnant.

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Bridging the gap for diabetes in pregnancy - an educational tool for Aborginal women's health.

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Following the development and launch of the Feltman diabetes education resource in 2010, over 600 models Australia wide have been utilised. Feltman was developed by the Victorian Aboriginal Community Controlled Health Organisation (VACCHO) and Diabetes Australia Victoria to make it easier for health workers to discuss diabetes within the Aboriginal community. Community and health worker feedback identified that while the resource helped to explain the main aspects of diabetes and its management, it did not adequately address diabetes in pregnancy and in particular gestational diabetes.

Gestational diabetes poses a significant health risk in the Aboriginal and Torres Strait Islander community where rates are at least 1.5 times higher than the non- Aboriginal population. Further concern is the higher incidence of type 2 diabetes in pregnancy being 10 times higher than the non -Aboriginal population. Feltmum, a diabetes in pregnancy 'add- on' pack for Feltman, was therefore developed to help address this gap in health outcomes between Aboriginal and non-Aboriginal women.

An expert working group including diabetes educators, midwives, dietitians and Aboriginal health workers was established to steer the project's development. Emphasis throughout the project has been to ensure relevance and cultural appropriateness for the Aboriginal community. This diabetes in pregnancy resource includes felt attachments for the Feltman model, cards to facilitate discussion, a 'key messages' reference guide for health workers, and an online instructional video. The 'add- on' is being made available to all Victorian agencies who received the initial Feltman. Training for the Feltmum resource will be provided to health workers and others working in women's health within the Aboriginal community.

The Feltmum add-on will help address an identified deficit in diabetes in pregnancy education in the Aboriginal community. It will provide further opportunity to inform women particularly of childbearing age about pre-existing and gestational diabetes and management strategies.

Pre-pregnancy care in women with diabetes: understanding the reasons why women do and don't attend

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Despite evidence that diabetes-specific pre-pregnancy care (PPC) can reduce the risk of adverse pregnancy outcomes in women with diabetes[1], many women do not seek PPC prior to conception[2].

This study aimed to describe factors associated with uptake of PPC, identify barriers to attendance and determine the perceived benefit of PPC.

A cross-sectional survey of women with diabetes was undertaken as part of the National Diabetes Services Scheme (NDSS)[3] Diabetes in Pregnancy National Development Program. The 66 item self-administered survey was available online or as hard copy. Randomly selected women aged 18-50 years with type 1 or type 2 diabetes registered on the NDSS, who consented to be contacted, were invited to participate; with additional women recruited online.

Of 6000 women invited, 967 respondents were eligible (17% response rate). Women who had previously been pregnant, were currently pregnant or trying to fall pregnant were included in data analysis (n=434). Respondents were predominately Australian born (79%), spoke only English (96%). 2% were of Aboriginal and Torres Strait Islander background. 54% of women reported having 'ever' attended PPC. Factors associated with attendance were analysed using Chi-square. T-tests were used to compare means. Results are summarised in the table.

		Attended PPC n=432	χ^2 p value
Type of diabetes	Type 1	57%	
	Type 2	39%	0.005
Education	Tertiary	65%	
	Not tertiary	45%	<0.001
Country birth	Australia	53%	
	Other	56%	ns
Marital status	Married/defacto	57%	
	Not married	31%	<0.001
Region	Metro/regional	57%	
	Rural	34%	0.004
Employment status	Currently employed	61%	
	Not employed	37%	<0.001

There was no difference in mean age between women who did and did not attend PPC (p=0.307). Reasons for not attending included being unaware that PPC was available (48%), having an unplanned pregnancy (47%), already knowing what to do (19%), falling pregnant sooner than expected (18%) and lack of available services (8%). Respondents who had previously attended PPC rated this from one (not helpful at all) to ten (extremely helpful) with a mean rating of 8±2. 68% scored 8 or above.

Our findings showed that women who attend PPC see benefits in doing so. However, falling pregnant unexpectedly or sooner than planned were major reasons for non-attendance. This highlights the need for preconception counselling and advice on appropriate contraception for all women with diabetes of childbearing age. Initiatives need to target those least likely to attend PPC. Further research is needed with ATSI and CALD women.

1. Murphy HR, Roland JM, Skinner TC, Simmons D, Gurnell E, Moorish NJ, Soo S-C, Kelly S, Randall J, Tompsett S, and Temple RC. Effectiveness of a regional pre-pregnancy care program in women with type 1 and type 2 diabetes: benefits beyond glycemic control. Diabetes Care 2010; 33: 2514–2520.
2. McElduff, A., et al., Pregestational diabetes and pregnancy: an Australian experience. Diabetes Care, 2005. 28(5): p. 1260-1.
3. The NDSS is an initiative of the Australian Government administered by Diabetes Australia.

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Placental proteoglycan Glypican expression is altered in gestational diabetes affected pregnancies.

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Publish consent withheld

1. Metzger, B.E., et al. . N Engl J Med, 2008. 358(19): p. 1991-2002.
2. Esko, J.D., et al. Essentials of Glycobiology. 2nd ed2009:
3. Iozzo, R.V.. Annu Rev Biochem, 1998. 67: p. 609-52.'
4. Yang, W.C.V., et al. Placenta, 2005. 26(10): p. 780-788.
5. Murthi, P.,et al Placenta, 2010. 31(8): p. 712-717.
6. Chui, A., et al Gynecol Obstet Invest, 2012. 73(4): p. 277-84.

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Placenta-derived exosomes and their concentration across pregnancies with gestational diabetes mellitus. A novel approach to the study of placental function.

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Objectives: The aim of this study was to establish the gestational-age profile of PdE in maternal plasma of GDM pregnancies and to determine the effect of exosomes on cytokine releases from endothelial cells.

Methods: Plasma samples were prospectively collected and a retrospectively stratified study design was used to quantify exosomes present in maternal plasma during normal (n=13 per group, 33 samples in total) and GDM (n=7 per group, 21 samples in total) pregnancies in early (11-14 weeks), mid (22-24 weeks) and late (32-36 weeks) gestation. Exosomes were isolated from plasma by differential and buoyant density centrifugation. The PLAP/CD63 ratio (i.e. immunoreactive PLAP content per exosome) was used as a measure of the contribution of PdE to total exosomes in maternal blood. The effect of exosomes on cytokine (GM-CSF, IL-2, IL-4, IL-6. IL-8, IL-10, IFN-γ and TNF-α) release from endothelial cells was established using protein solution array analysis (Bioplex).

Results: Variation in the concentration of PdE in maternal plasma was assessed by ANOVA with the variance partitioned between gestational age and pregnancy status (i.e. normal or GDM). Both gestational age and pregnancy status were identified as significant factors (ANOVA, $p<0.05$). Post-hoc analyses established that PdE concentrations increased during gestation (FT, ST and TT) in both normal and GDM pregnancies. However, the increase was significantly greater in GDM (~2.2-fold, ~1.5-fold and ~1.8-fold greater in the FT, ST and TT compared to normal pregnancies, respectively). We observed that PLAP/CD63 ratio decreased dramatically in GDM pregnancies ($p < 0.05$). Exosomes (100 mg exosomal protein/ml) isolated from GDM pregnancies significantly increased ($p <0.05$) the release of all cytokines from human umbilical vein endothelial cells (HUVEC) when compared to control (i.e. without exosomes) and normal pregnancies, with the exception of IL-2 and IL-10 ($p > 0.05$).

Conclusions: The concentration and bioactivity of exosomes in maternal blood is higher in GDM than in normal pregnancies. While the role of exosomes during GDM remain fully elucidated, these characteristics could potentially be used as diagnostic markers for exosome profiling to screen asymptomatic populations

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Pre-pregnancy dietary patterns are associated with risk of developing gestational diabetes: results from a population-based cohort study

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Background: Evidence on the association between dietary intake and risk of developing gestational diabetes mellitus (GDM) is predominantly focused on intake of single nutrients and foods. Evidence on overall diet before pregnancy is lacking. The aim of our study was therefore to examine associations between pre-pregnancy dietary patterns and incidence of GDM in a prospective population-based cohort study of women of reproductive age.

Methods: We used data from the Australian Longitudinal Study on Women's Health. We included 3,853 women aged 28 (SD 1.4) years who were not pregnant at baseline in 2003 and had no history of GDM or type 1 or type 2 diabetes. Pre-pregnancy dietary patterns were identified using factor analysis based on a validated 101-item food frequency questionnaire. GDM was self-reported for each pregnancy during 9 years follow-up (until 2012) and validated in a subsample. Multivariable regression analyses with generalised estimating equations were performed to estimate relative risks (RR) and 95% confidence intervals (CI).

Results: Among 3,853 women, 292 GDM cases (4.4%) in 6,626 pregnancies were documented. No associations were found for the 'Fruit and low-fat dairy' and 'Cooked vegetables' dietary patterns. The 'Meat, high-fat and sugar' dietary pattern was associated with higher GDM risk after adjustment for socioeconomic, reproductive and lifestyle factors (RR (95% CI) per SD increase in score: 1.38 (1.02, 1.86)). This association was attenuated after additional adjustment for BMI (1.35 (0.98, 1.81)). In stratified analysis, the 'Meat, high-fat and sugar' dietary pattern was associated with significantly higher GDM risk in parous and obese women, and in women with lower educational qualifications. The 'Mediterranean-style' dietary pattern was associated with a 15% lower GDM risk after adjusting for socioeconomic, reproductive and lifestyle factors and BMI (95% CI 0.76, 0.98).

Conclusions: Our findings indicate that a pre-pregnancy 'Mediterranean-style' dietary pattern (high consumption of fruit, vegetables, whole-grains, nuts and fish) is associated with lower GDM risk. A pre-pregnancy 'Meat, high-fat and sugar' dietary pattern (high consumption of red and processed meat and snacks) is associated with higher GDM risk, particularly in high-risk groups. Further prospective studies in a range of populations are needed to confirm these findings.

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A Single Centre 10 year Retrospective Study on Pregnancy outcomes in Type 1 and Type 2 Diabetes.

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Introduction:

Pregnancies affected by Type 1 (T1DM) and Type 2 diabetes (T2DM) have been associated with poorer obstetric outcomes. To complement current Australian literature, we conducted an exploratory 10-year retrospective study of a single tertiary obstetric hospital exploring multiple associations of established predictive factors with pregnancy outcomes in women with pre-existing diabetes.

Methods:

Clinical and biochemical characteristics of women with T1DM(n=93) and T2DM(n=106) between 2004-2014 were recorded. Group comparisons were performed using independent-samples t-tests and chi-square tests. Multivariable logistic regression models were formulated for major obstetric outcomes (pre-eclampsia, pre-term birth, neonatal intensive care admission, large/small for gestational age, Apgar<7 at 5minutes, neonatal hypoglycaemia) as dependent variables,and estimated Glomerular Filtration Rate (eGFR) using Chronic Kidney Disease Epidemiology Cohort formula, blood pressure, HbA1c, age, type of diabetes, and BMI as independent variables throughout pregnancy. Due to the exploratory nature of the study, no correction for multiple testing was undertaken.

Results:

Compared to women with T2DM, neonatal outcomes were poorer in T1DM including large for gestational age (65% vs.36%; $p < 0.0001$) and macrosomia defined as > 4000g (25% vs.6%; P<0.0001). HbA1C was 7.1% ±1.0% vs. 6.5% ±0.8% (p=0.02) in T1DM and T2DM respectively. Risk of the other major outcomes was similar. The overall proportion of pre-eclampsia was 15% (comparison to 5% in the general population). There were 2 fetal deaths in utero in T1DM and 3 in the T2DM group.

For the pooled analysis, median HbA1c was 6.5±0.95% (47mmol/mol). Higher HbA1c in the third trimester was associated with large for gestational age (OR1.9, p=0.04 95CI 1.05-3.45).No association with other major adverse outcomes was detected with HbA1c.Mean blood pressure was 119/72±11/7mmgHg.Higher mean systolic blood pressure throughout pregnancy, was associated with a higher risk of developing pre-term birth<37 weeks (p=0.01). Higher diastolic blood pressure during second trimester was associated with a higher risk of pre-eclampsia (p=0.01). Association between eGFR with pre-eclampsia and pre-term birth< 32 weeks was detected.

Conclusion:

Despite relatively good overall blood pressure and reasonable glycaemic control, unfavourable outcomes remain high in pregnant women with pregestational diabetes. Although observational, these data may be helpful for counselling women with diabetes regarding pregnancy outcomes.

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Screening for Gestational Diabetes Mellitus and Overt Diabetes in the Kingdom of Tonga Results of the First 6 months of screening

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Background: Gestational Diabetes Mellitus (GDM) and Overt Diabetes (ODIP) are conditions increasing in prevalence worldwide. Their impact in the South Pacific is unknown. Tonga has a high prevalence of obesity, impaired glucose tolerance and diabetes, but had no GDM screening program.

Aims: To estimate the prevalence rate of GDM and ODIP in Tonga, trial novel screening methods including the use of HbA1c and random blood sugar (RBS) and to develop a sustainable and cost effective universal maternal screening model for developing nations. We also collected anthropomorphic data to facilitate research.

Methods: The multidisciplinary task force developed evidence based screening guideline. Mothers were screened for WHO 2013 ODIP at booking with a random blood sugar (≥7 mmol). We confirmed cases of ODIP with an HbA1c within 1-2 weeks using the IADPSG criteria for diagnosis. At 24-28 weeks gestation we invited all women to be tested for GDM and ODIP with a 75g Oral Glucose Tolerance Test (OGTT) using Canadian Diabetes Association (CDA) diagnostic GDM criteria(F-5.3/1hr-10.6/2hr-9.0 mmol) to minimize immediate impact on the diabetes service .

Results: We screened 619 mothers with RBS, with 52 (8.4%) suspected ODIP cases. Mean age was 28.7(+/-0.9) years , mean weight 95.5(+/-1.9)kg and, mean BMI 33.8(+/-0.4)kg/m^2 . Of these, 11(21.1%; 1.8% overall) had ODIP confirmed by either HbA1c or OGTT. 324(52.3%) patients had an OGTT, with 184(56.8%) diagnosed with GDM. No significant difference in Age, Travel distance, BMI or Parity was detected between attenders and non-attenders.. We identified a total of 17 (5.2%) cases of ODIP. The WHO criteria 2013 criteria would identify 243 (75.0%) cases of GDM. Those diagnosed with GDM on OGTT were more likely to have elevated fasting than post postprandial blood sugars (54.1% vs. 2.8%, p<0.0001 Fisher's exact test).

Conclusions: Tonga's rates of GDM and ODIP are higher than those reported to date globally. Most patients identified for re-testing for ODIP with RBS did not have their diagnosis confirmed by other screening modalities. The optimal screening protocol for Tonga is still evolving, but needs to recognize fasting dysglycemia. Ongoing research will focus on maternal and neonatal outcomes of screening and screening barriers.

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The associations of multiple anthropometric measurements with subsequent gestational diabetes in Aboriginal women

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Publish consent withheld

Vitamin D supplementation in pregnant women with diabetes mellitus residing in Far North Queensland

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Background:

Women with diabetes in pregnancy (both pre-existing and gestational, GDM) are routinely tested in Far North Queensland for low serum vitamin D levels, following the results of a recent study which revealed around 20% of such women had either insufficient or deficient levels of vitamin D.[1]

Aim:

To assess the appropriateness of vitamin D supplementation in the treatment of low vitamin D levels in this population of pregnant women.

Methods:

A prospective chart audit was conducted between February 2014 and February 2015 of all women attending the diabetes clinic of the Integrated Women's Health Unit at Cairns Hospital. All women were given an initial pathology request form to assess serum vitamin D levels. Those women diagnosed with vitamin D insufficiency or deficiency were given a script for supplementation and a repeat pathology request form to monitor serum vitamin D levels.

Results:

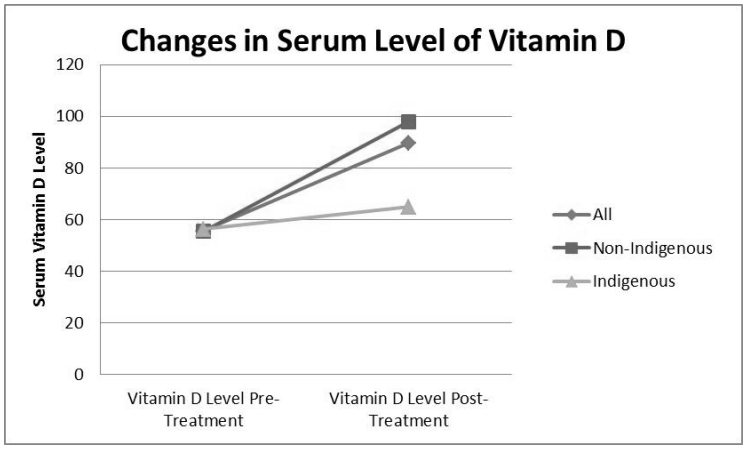
A large proportion of women with GDM did not proceed to have a blood test to assess their vitamin D levels (42.9%). Of the women diagnosed with vitamin D insufficiency or deficiency, 69% did not have a follow-up blood test. Of those women who had a follow-up blood test, mean serum vitamin D levels were found to have increased significantly. However, when the sample was stratified by ethnicity, it was found that the mean serum vitamin D levels of non-Indigenous women increased significantly, whereas the mean serum vitamin D levels of Indigenous women did not increase significantly.

Conclusions:

The results of this study indicate that the current guidelines for monitoring and treatment of vitamin D deficiency in pregnancy are not suitable for the majority of pregnant women with inadequate vitamin D levels in Far North Queensland. Other methods of treatment need to be considered including culturally appropriate education regarding vitamin D inadequacy and the possibility of providing supplements to women most at risk.

Key message:

Further research is required to assess the most effective education and treatment solution.



1. Cheng A, de Costa C, McLean A, Woods C. Vitamin D concentrations in pregnant women with diabetes attending for antenatal care in Far North Queensland. ANZJOG 2014; 54 (3): 275-8.

Comparing models of care for management of gestational diabetes at the Royal Women's Hospital: endocrinologist-based model versus obstetrician-endocrinologist mixed model of care

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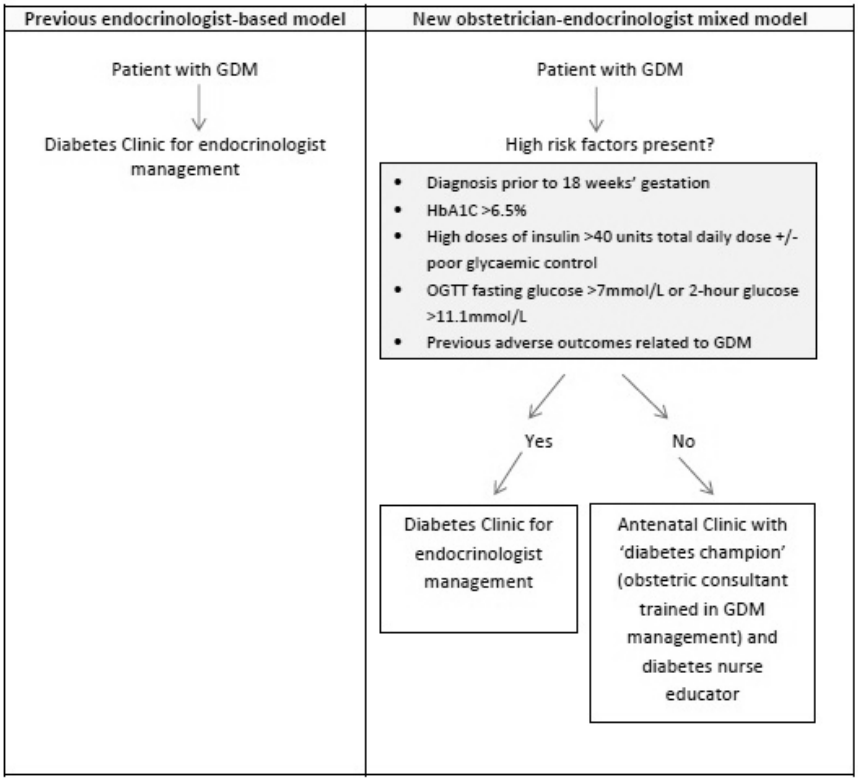
Introduction

In view of the anticipated increase in gestational diabetes mellitus (GDM) diagnoses with the new diagnostic criteria (1,2, the Royal Women's Hospital changed the model of care for women with GDM from a endocrinologist-based model to an obstetrician-endocrinologist mixed model in August 2012 (Figure 1).

Figure 1. Change in model of care in management of women with GDM



Objectives

The aim of our study was to assess the impact of change in model of care of women with GDM on maternal-foetal outcomes at a tertiary referral centre

Methods

Clinical details of all women with singleton pregnancies and GDM who delivered between January 2010 and December 2014 were obtained via the Maternity Clinical Information System. Maternal-fetal outcomes were compared between the endocrinologist-based model and the obstetrician-endocrinologist mixed model. Statistical analyses were conducted using chi-square analysis for categorical data (SPSS).

Results

There were no significant differences in baseline characteristics between the two groups. Compared to the endocrinologist-based model, pregnancies under the new obstetrician-endocrinologist mixed model had slightly higher rates of oligohydramnios (1.4% vs 0.4%, p=0.022) and babies who were small for gestational age (4.2% vs 1.9%, p=0.003), but lower rates of neonatal jaundice (2.5% vs 7%, p=0.00) and macrosomia (5.7% vs 7.9%, p=0.065). Under the new model, women with higher risk were still managed through the Diabetes Clinic. There were no significant differences in rates of neonatal hypoglycaemia or shoulder dystocia. Of note, there were six cases of fetal death-in-utero in the obstetrician-endocrinologist mixed model group: four cases had a non-diabetes related cause of death; in the remaining two cases, no cause of death was identified.

Conclusions

The obstetrician-endocrinologist mixed model of care is a safe and practical approach to the management of low-risk women with GDM.

1. 1. IADPSG 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
2. 2. Moses RG, Morris GJ, Petocz P, San Gil F, Garg D. The impact of potential new diagnostic criteria on the prevalence of gestational diabetes mellitus in Australia. MJA 2011; 194:7:338-340.

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Antenatal expression and storage of colostrum in diabetic women

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Publish consent withheld

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Breastfeeding in hospital among Indigenous and non-Indigenous women in Australia after gestational diabetes: An opportunity for long term benefits.

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Breastfeeding can reduce long-term cardio-metabolic risks associated with gestational diabetes mellitus (GDM) for women and their infants. However, little is known about breastfeeding among Indigenous women in Australia with GDM. Our study aimed to investigate rates of '*any*' and '*only*' breastfeeding among Indigenous and non-Indigenous women with and without GDM, and associated factors among women with GDM, in the 24 hours prior to hospital discharge. We conducted a retrospective cohort study of singleton infants born following GDM pregnancy (6.5% pregnancies), using linked electronic hospital records and routinely collected birth data from 1/7/2007 to 31/12/2010 (n= 617 infants), with a subsample of medical records reviewed for additional data (n=365 infants). Aggregate birth data for infants born without GDM were included for rate comparison (n=7894 infants). Analyses were conducted using logistic regression models. We found over 90% of all women reported *any* breastfeeding in the 24 hours prior to hospital discharge, with no significant differences observed by Indigenous or GDM status. Breastfeeding *only,* among women *without* GDM, was recorded for approximately 80% of both Indigenous and non-Indigenous women. Women *with* GDM, were significantly less likely to breastfeed *only* (OR 0.32, 95% CI 0.27-0.38, p<0.0001) with this reduction seen equally in both Indigenous (52.5% breastfeeding *only*) and non-Indigenous women (59.8%). Indigenous women *with* GDM were less likely than non-Indigenous women *with* GDM to breastfeed *only*(OR 0.78, 0.70-0.88, p<0.0001). There was evidence of an increase in breastfeeding *only* from 2007 to 2010 (p<0.0001). Among women *with* GDM, breastfeeding *only* was less likely among women who had had a caesarean or an infant born at less than 37 weeks gestation; while *any* breastfeeding was less likely among Indigenous women who smoked and more likely among Indigenous women who had had an induction. In conclusion, most women reported *any* breastfeeding around the time of hospital discharge. However, despite improvements there are barriers to breastfeeding *only* in hospital among women with GDM, particularly among Indigenous women. Support for all women with GDM to exclusively breastfeed in hospital is needed, particularly for Indigenous women and their infants to reduce risks of cardio-metabolic disease associated with gestational diabetes.

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Treatment targets for women with pregnancy hyperglycaemia

Veronica Wong, KELLY LAMBERT, Gary Morris, Fernando Sangil, Robert Moses

ADIPS has endorsed the WHO diagnostic targets for hyperglycaemia in pregnancy. While ADIPS has indicated some treatment targets for diagnosed women, it is also an area requiring more research. One of the difficulties of determining a "normal" range in pregnancy is the probability of including the results of women who are abnormal, that is, those who have pregnancy hyperglycaemia.

The results of Pregnancy Oral Glucose Tolerance Tests (POGTTs) by Southern IML (SIML), a major private pathology provider in the Illawarra Area have been prospectively maintained over a three year period (2102-2014). Women in the Area are ethnically similar to the population of Australia. A previous study has demonstrated that about half of the tests by SIML are for women attending the antenatal clinic and the other half are for women attending private obstetric providers. The results from SIML were only considered for women tested between 20 and 32 weeks gestation.

There were 3888 results available for review in this time period. 482/3888 (12.4%) of women were diagnosed with pregnancy hyperglycaemia and their results were not considered. For the women without hyperglycaemia in pregnancy, the mean ± 1SD fasting glucose (mmol/L) was 4.4 ± 0.3, one hour 6.8 ± 1.4 and 2 hours 5.7 ± 1.2. Thus, after a POGTT, the upper range (mean + 2SD) in this normal group of women for fasting glucose was 5.0 mmol/L, one hour 9.6 and two hour 8.1. The results increased slightly with age with women in the 20-25 year (n = 303) group having an upper range of fasting of 4.9 mmol/L while women over 40 years (n = 106) having an upper range of 5.1 mmol/L. The potential differences between a post GTT result and a postprandial result are acknowledged.

Overall, the pregnancy hyperglycaemia fasting diagnostic level is ≥ 5.1 mmol/L. These data support the treatment target of trying to achieve a fasting result of 5.0 or less. These results are similar to data obtained from low risk women published some years ago.

1. Moses, RG.; Shand, J.; Tapsell, L. (1997) The Recurrence of Gestational Diabetes: Could Dietary Differences in Fat Intake Be an Explanation? Diabetes Care 20 (11) 1647-1650
2. Nankervis A, McIntyre HD, Moses R, Ross GP, Callaway L, Porter C, et al. ADIPS Consensus Guidelines for the Testing and Diagnosis of Hyperglycaemia in Pregnancy in Australia. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf
3. WHO Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy (2013). Available online at: http://apps.who.int/iris/bitstream/10665/85975/1/WHO_NMH_MND_13.2_eng.pdf
4. Manzoor, N.; Moses, RG. (2013) Diagnosis of Gestational Diabetes Mellitus: A Different Paradigm to Consider. Diabetes Care 36 e187
5. Moses RG, Morris GJ, Petocz P, San Gil F, Garg, D. (2011) The impact of potential new diagnostic criteria on the prevalence of gestational diabetes mellitus in Australia. Med J Aust. 194; 338-340
6. Moses RG, Moses M, Russell KG, Shier GM. (1998) The 75-g Glucose Tolerance Test in Pregnancy. Diabetes Care 21 (11) 1807
7. Hernandez TL. (2014) Glycemic Targets in Pregnancies Affected by Diabetes: Historical Perspective and Future Directions. Current Diabetes Reports. In Press. Published online by SpingerLink.

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The prevalence of pregnancy hyperglycaemia in Australia.

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ADIPS has recently endorsed the WHO criteria for the diagnosis and nomenclature of pregnancy hyperglycaemia. Women with an abnormal glucose result after a Pregnancy Oral Glucose Tolerance Test (POGTT) are diagnosed with hyperglycaemia in pregnancy and subdivided into diabetes and gestational diabetes mellitus. The Illawarra area around Wollongong is very suitable for pregnancy-related epidemiological research with one public obstetric service and a dominant private pathology provider. The women in the Illawarra Area are ethnically similar to the Australian population.

The results of all POGTTs performed by Southern IML Pathology (SIML) and the South Eastern Area Laboratory Service (SEALS) for the Wollongong Hospital (TWH) over a three year period 2012 – 2014 have been retained and were used for analysis. Data were considered if a woman lived in a local postcode area and had all three results on the POGTT. Approximately half the tests done by SIML were for women attending the public antenatal clinics and the remainder for women attending a private obstetric provider. All the tests at TWH were for women attending the antenatal clinic.

There were 2698 results available from TWH and 4698 from SIML, with 7,396 results in total. The overall prevalence of pregnancy hyperglycaemia was 954/7396 (12.9%). The prevalence was lower for tests done by TWH 319/2698 (11.8%) compared to 635/4698 (13.5%) by SIML. In the past, it has been shown that women attending SIML were older than women attending TWH. Of the 954 women with hyperglycaemia, 27 (2.8%) had diabetes and 927 (97.2%) had GDM. Overall, only 27/7396 (0.4%) of women being tested had diabetes.

These data contain a mixture of results from both the public and private system. Different results could be expected using selected data from areas with a large at-risk population or from either the public or the private sector. The overall prevalence of pregnancy hyperglycaemia was 12.9%, a result now not dissimilar to that reported in a prospective study four years ago. Diagnosis with the new criteria will result in an approximate increase of one-third in the prevalence of pregnancy hyperglycaemia.

1. Nankervis A, McIntyre HD, Moses R, Ross GP, Callaway L, Porter C, et al. ADIPS Consensus Guidelines for the Testing and Diagnosis of Hyperglycaemia in Pregnancy in Australia. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf
2. WHO Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy (2013). Available online at: http://apps.who.int/iris/bitstream/10665/85975/1/WHO_NMH_MND_13.2_eng.pdf
3. Moses RG, Morris GJ, Petocz P, San Gil F, Garg, D. (2011) The impact of potential new diagnostic criteria on the prevalence of gestational diabetes mellitus in Australia. Med J Aust. 194; 338-340
4. Manzoor, N.; Moses, RG. (2013) Diagnosis of Gestational Diabetes Mellitus: A Different Paradigm to Consider. Diabetes Care 36 e187
5. Hernandez TL. (2014) Glycemic Targets in Pregnancies Affected by Diabetes: Historical Perspective and Future Directions. Current Diabetes Reports. In Press. Published online by SpingerLink.

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Retinal assessment in Women with Gestational Diabetes Mellitus

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Introduction

Retinopathy is a micro-vascular complication of diabetes. Although signs of retinopathy were thought to be rare in subjects with normoglycaemia, some studies had reported a prevalence of retinopathy to be as high as 8% among subjects with fasting glucose levels <7.0mmol/L. Women with gestational diabetes (GDM) have an increased risk of developing type 2 diabetes and vascular disease later in life compared with women with normal glucose tolerance during pregnancy. Retinal vasculature is an easily accessible site for non-invasive assessment of micro-circulation. It has been suggested that retinal arteriolar narrowing is independently associated with risk of diabetes, and other studies have demonstrated that retinal arteriolar and venous caliber, including arteriolar:venular ratio (AVR), may predict future vascular risks, even in subjects without diabetes

Objectives

In this study we recruited 50 women with GDM (Group A) and 15 women with normal glucose tolerance (Group B) and screened them for retinopathy, including evaluation of macular thickness, as well as assessing their retinal vasculature.

Method

The women were recruited from the antenatal clinic at Liverpool Hospital. At 6-8 weeks' post-partum, the subjects had their retinal photograph taken and analysed, while individual arterioles and venules up to 1 disc diameter from optic disc margin were measured

Results

Among the fifty women with GDM, 30 required insulin therapy. There was no difference in age, maternal body mass index, smoking and ethnicity between women in Groups A and B. None of the women demonstrated any early diabetic retinopathy, and the central subfield thickness was also not different between the 2 groups. Twenty-six of our patients had their retinal vessels graded (16 from Group A, 10 from Group B). There was no significant difference in the retinal arteriolar and venular caliber between the 2 groups, but the retinal AVR was significantly lower in Group A.

Conclusions:

Our small pilot study showed no evidence of any background retinopathy among our cohort, but women with GDM demonstrated reduced retinal AVR, and thus may have an increased risk of developing diabetes and vascular disease in the future.

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Accuracy of the NSW Mothers and Babies' Data for Gestational Diabetes Mellitus

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The International Association of Diabetes and Pregnancy Study Groups (IADPSG) recommended changes to the gestational diabetes mellitus (GDM) diagnostic criteria, which were adopted by Australasian Diabetes in Pregnancy Society (ADIPS) in 2011.

GDM is diagnosed if at any stage of pregnancy one or more of the following blood glucose values are abnormal after a 75g glucose tolerance test: fasting ≥ 5.1mmol/L, 1 hour ≥ 10mmol/L and 2 hour ≥ 8.5mmol/L.

The Illawarra Area around Wollongong adopted the ADIPS criteria in 2011. We wanted to determine the accuracy of GDM documentation in a private hospital setting (Illawarra Private Hospital {IPH}).

We reviewed the medical records of all women who delivered at IPH from January 2012 – December 2012, and the number of women who were documented with and without GDM. This was cross referenced with Southern IML Pathology's list (the major private pathology provider in the Area) of pregnant women with glucose levels that met the GDM criteria from June 2011 to December 2012. Women were considered to have GDM if they had an abnormal GTT in the 9 months prior to delivery.

A total of 1010 women gave birth in IPH in 2012. Of these, 69 were recorded with GDM (6.8%), and 13 with known diabetes. Through cross referencing with Southern Pathology results, another 84 women with GDM were further identified.

Of the 69 women documented to have GDM, 57 were identified from Southern Pathology's lab results. Based on this, approximately 82% of pregnant used this pathology provider.

The number of women with recorded GDM was 69. The number of women with known GDM not recorded was a minimum of 84. Thus the prevalence of GDM was at least 153/1010 (15%), and likely to be higher. If these data errors are reflected across the state, then the official NSW Mothers and Babies data is likely to be inaccurate. Amongst other things, this has implications for health planning and resource allocation.

1. Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care. 2010; 33(3):676-82.
2. Nankervis A, McIntyre HD, Moses R, Ross GP, Callaway L, Porter C, Jeffries W, Boorman C, De Vries B, McElduff A. Australasian Diabetes in Pregnancy Society.ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf. Accessed January, 2015.
3. Centre for Epidemiology and Evidence. New South Wales Mothers and Babies 2012. Sydney: NSW Ministry of Health, 2014.
4. Moses RG, Colagiuri S. The extent of undiagnosed gestational diabetes mellitus in New South Wales. Med J Aust. 1997; 167 (1):14-16.
5. Moses RG, Webb AJ, Comber CD, Walton JG, Coleman KJ, Davis WS, McCosker CJ. Gestational diabetes mellitus: compliance with testing. Aust N Z J Obstet Gynaecol. 2003; 43(6):469-70.
6. Moses RG, Webb AJ, Comber CD. Gestational diabetes mellitus: accuracy of Midwives Data Collection. Med J Aust. 2003 Aug 18;179(4):218-9.

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Insurance and Gestational Diabetes Mellitus

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In 2010, the International Association of Diabetes and Pregnancy Study Groups (IADPSG) suggested new diagnostic criteria for the diagnosis of gestational diabetes mellitus (GDM), which subsequently has been endorsed by the World Health Organisation (WHO).

Adoption of the new criteria has been fragmented. One of the objections raised was that a diagnosis of GDM would lead to increases in insurance premiums. To determine if this was the case, we surveyed all the major life and disability insurance companies in Australia and the United Kingdom (UK).

The companies were provided with a hypothetical client: "a professional woman, 40 years old, a lifelong non-smoker, currently taking no medications, with a body mass index of 25 kg/m^2, and has had no past health problems apart from GDM during her second pregnancy 10 years ago. Post delivery oral glucose tolerance test was normal."

With the assistance of Australasian Life Underwriting and Claims Association (ALUCA) and Assurance Medical Underwriting Society (AMUS), 29 companies were identified, 12 from Australia and 17 from UK. In the analysis, we excluded 3 UK companies, because they did not provide products directly to the public. Of the 26 companies included in the study, 21 replied (81% response rate). Together they covered approximately 85% of the retail life insurance new business, written in Australia (94%) and UK (76%) respectively.

They were unanimous that a previous diagnosis of GDM would not lead toan additional premium to life insurance products. Similarly all but one company would not add an extra premium to disability income protection.Overwhelmingly the Australian and UK insurance companies have indicated that a previous diagnosis of GDM would not lead to increase in life and disability insurance premiums. Objections to the use of new criteria for the diagnosis of GDM cannot be opposed because of these hypotheticaland unsubstantiated concerns.

1. World Health Organization. Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy. Geneva: WHO Press; 2013.
2. Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care. 2010; 33(3):676-82.
3. Nankervis A, McIntyre HD, Moses R, Ross GP, Callaway L, Porter C, Jeffries W, Boorman C, De Vries B, McElduff A. Australasian Diabetes in Pregnancy Society.ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia. http://adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014_000.pdf. Accessed January, 2015.
4. Zheng AS, O'Leary T, Moses RG. Gestational diabetes mellitus and life insurance: what is the impact of gestational diabetes mellitus on life insurance premiums? Diabetes Care. 2014 Nov;37(11):e235.
5. Zheng AS, O'Leary T, Moses RG. Gestational diabetes mellitus and life assurance: the United Kingdom perspective. Diabetic Medicine. Pending publication.
6. Ryan EA. Balancing weight and glucose in gestational diabetes mellitus. Diabetes Care 2013; 36(1):6-7.
7. d'Emden MC. Reassessment of the new diagnostic thresholds for gestational diabetes mellitus: an opportunity for improvement. Med J Aust 2014 18; 204 (4): 211.

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Impact of new GDM diagnostic criteria in the Australian Capital Territory

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Background: The new ADIPS/IADPSG/WHO GDM diagnostic criteria (OGTT for all women between 24-28 weeks gestation with early screening if risk factors) were adopted in the ACT on the 1st Jan 2015. An audit of patients diagnosed and managed in the ACT for the first 5 months of 2014 was compared with those of the first 5 months of 2015. The old ADIPS diagnostic pathway was followed (glucose challenge test (GCT) followed by oral glucose tolerance test (OGTT)) in the first half of 2014.

Method: Clinic attendance records and patient charts were assessed and details were recorded and analysed.

Results: An increase of 37% in patients diagnosed and managed with GDM occurred from the first 5 months of 2014 to the same period in 2015 (n=236 and 323, respectively). The number diagnosed before 24 weeks was 48 (21.3% of all diagnosed) in 2014 and 66 (20.5% of all diagnosed in 2015), an increase of 38% in absolute number from 2014 to 2015. The average age (33±5 vs 32±5 years, mean±SD), BMI (28±7 vs 28±7 kg/m^2) and gestational age of first attendance with GDM (27±5 vs 27±5 weeks) were not different between the 2014 and 2015 cohorts, respectively. The diagnostic OGTTs of the 2015 cohort showed a slightly higher fasting plasma glucose (PG)(4.9±0.7 vs 5.0±0.6 mmol/l, p=0.046), a trend for a lower 1 hour PG (9.6+1.6 vs 9.3±1.7 mmol/l, p=0.052) and a markedly lower 2 hour PG (9.0±1.3 vs 7.9±1.6, p<0.0001). GDM was diagnosed on a fasting glucose in 19% of subjects in 2014 compared to 50% in 2015. The percentage of GDM subjects managed with insulin in the ACT fell from 50% in 2014 to 37% in 2015.

Conclusion: The change in diagnostic criteria has resulted in a substantial increase in women diagnosed with GDM and therefore workload for the ACT Health Diabetes Service. As expected, more women are now diagnosed on fasting blood glucose levels rather than 2 hour blood glucose levels of the OGTT and the severity of glucose intolerance is on average less severe.

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Pregnancy outcomes in women diagnosed with gestational diabetes mellitus in the ACT according to stratification to low and high risk management pathways

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Objectives: Gestational Diabetes Mellitus (GDM) patients are stratified into low-risk and high-risk groups in the ACT according to whether their glycaemic control reaches the target levels with lifestyle measures only. High-risk patients are referred to a multidisciplinary "diabetes in pregnancy" team, while low-risk patients continue regular antenatal care. The aims of this study were to test the effectiveness of the current stratification system and to determine whether low-risk patients have satisfactory perinatal outcomes, considering their less intensive antenatal care.

Research Design and Methods: A retrospective clinical audit of GDM patients treated in the ACT between 01/01/2010 and 30/06/2014 stratified into low- and high-risk management pathways according to home glucose monitoring levels was conducted. Maternal demographic data and neonatal/maternal clinical outcomes data were analysed.

Results:Low-risk (n=509) compared to high-risk (n=466) GDM mothers were younger (31.7±4.8 vs 32.6±5.3 years-old, p=0.009), leaner [body mass index (BMI) 26.3±6.7 vs 29.3±7.5 kg/m^2,p<0.001], more likely to be South-East Asian (19.4% vs 11.9%, p=0.002), less parous (0.7±1.0 vs 1.0±1.2 times, p<0.001), had less past GDM (13.2% vs 23.2%, p<0.001), less family history of diabetes (55.4% vs 67.0%, p=0.001) and a lower fasting glucose level (4.9±0.5 mmol/l vs 5.0±0.8 mmol/l, p<0.001). Low-risk mothers had less pregnancy-induced hypertension (PIH) (6.1% vs 11.8%, p=0.002), induced labour (23.2% vs 50.6%, p<0.001) and elective caesarean-sections (CS) (14.1% vs 20.4%, p=0.010). Rates of emergency CS were similar in the two groups. Likelihood of preterm delivery (before 37 weeks), after adjustment, was increased in the low-risk group (odds ratio 1.897, 95% confidence interval 1.137-3.164) due to increased spontaneous preterm deliveries (6.1% vs 2.6%, p=0.010). There were no differences in rates of adverse neonatal outcomes between the groups.

Conclusion:The stratification system is effective: low-risk patients were younger, leaner, and had less past GDM, less family history of diabetes and lower fasting glucose during the OGTT. The low-risk group had a considerably lower rate of PIH and delivery intervention and a comparable rate of emergency CS and neonatal complications. The treatment pathway of low-risk GDM patients is generally safe. However, the higher rate of preterm delivery among low-risk women warrants further investigation.

AUTHOR INDEX

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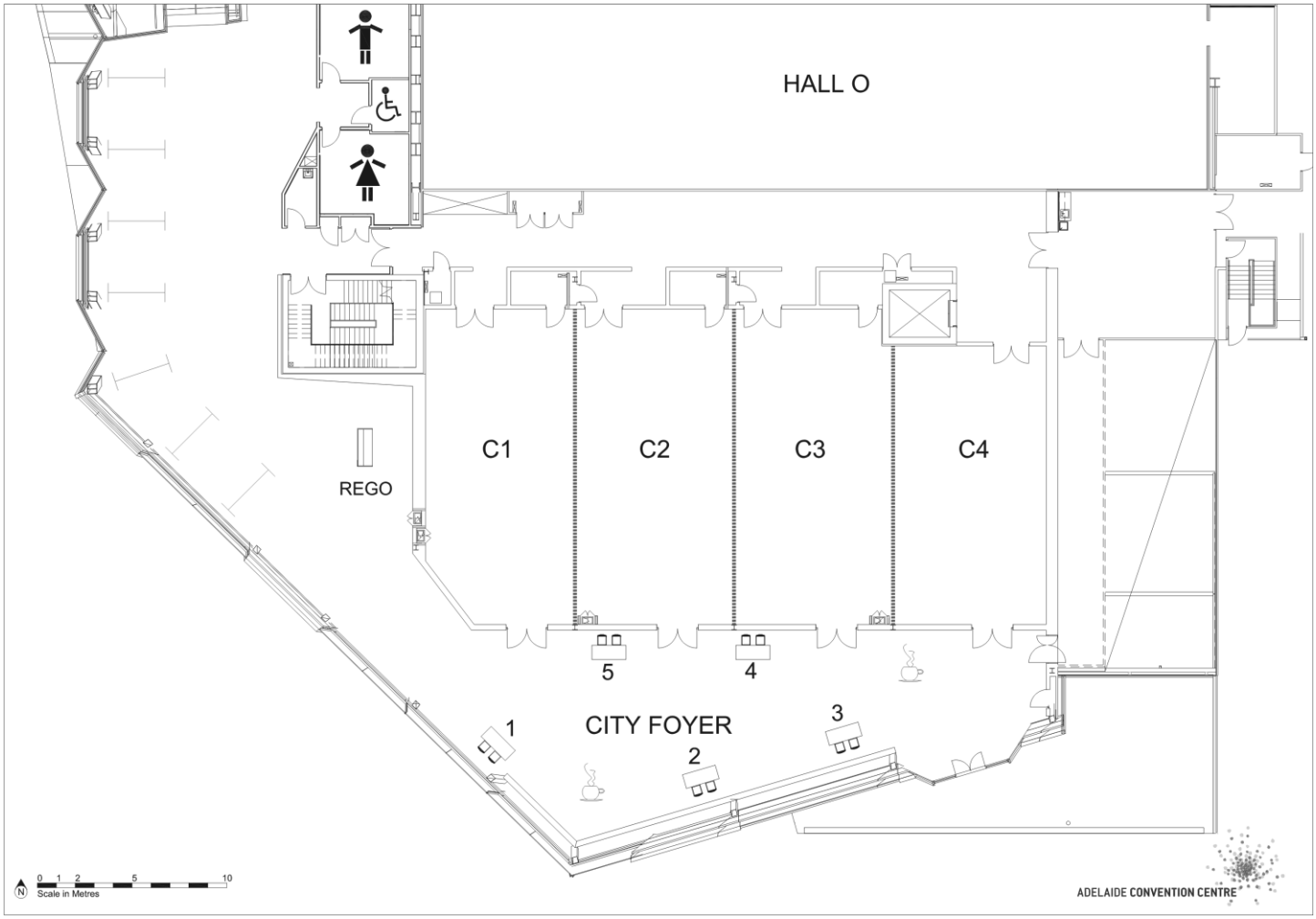

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For more information regarding the Diabetes in Pregnancy Programme, contact Melinda Morrison, National Programme Leader melindam@diabetesnsw.com.au. For information about the NDSS visit ndss.com.au or call the NDSS infoline on 1300 136 588.

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