UNIVERSITI PUTRA MALAYSIA

DETERMINANTS AND PREGNANCY OUTCOMES OF MATERNAL GLYCEMIA

YONG HENG YAW

FPSK(P) 2017 40

DETERMINANTS AND PREGNANCY OUTCOMES OF MATERNAL GLYCEMIA

By

YONG HENG YAW

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillments of the Requirements for the Degree of Doctor of Philosophy

July 2017

COPYRIGHT

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Doctor of Philosophy

DETERMINANTS AND PREGNANCY OUTCOMES OF MATERNAL GLYCEMIA

By

YONG HENG YAW

July 2017

Chairman : Professor Zalilah Mohd Shariff, PhD
Faculty : Medicine and Health Sciences

Both gestational diabetes mellitus (GDM) and hyperglycemia less severe than GDM are commonly associated with risk of adverse pregnancy outcomes. This study consisted of two phases. The first phase of study was to determine the cut-off point for maternal hyperglycemia for the detection of adverse pregnancy outcomes. The second phase of study was to determine the factors and outcomes of pregnancies complicated by maternal hyperglycemia.

The first phase of study was a retrospective cohort study involving 1,356 pregnant women who were registered with and attended antenatal checkups at two Maternal and Child Health (MCH) clinics in Seremban District, Negeri Sembilan. The antenatal booklet kept at the MCH clinic was used as a data source. Demographic and socioeconomic, obstetrical, anthropometric, biochemical and birth information of infants were extracted. Hyperglycemia was defined as either or both fasting plasma glucose (FPG) 4.8–5.5 mmol/l or two-hour plasma glucose (2hPG) 7.5–7.7 mmol/l. GDM was diagnosed according to the Ministry of Health's (MOH) criteria of either or both FPG ≥ 5.6mmol/l or 2hPG ≥ 7.8 mmol/l.

The second phase of study was a prospective cohort study in which a total of 282 pregnant women with normal glycemia were recruited from three MCH clinics in Seremban District, Negeri Sembilan and followed-up until delivery. A standard 75g Oral Glucose Tolerance Test was performed between 24–32nd weeks of gestation. Socio-demographic, anthropometric, biochemical, dietary, physical activity, smoking, and other data were collected using a pre-tested, interviewer-administered questionnaire at follow-ups of women. Pregnancy and birth information were obtained from medical records.

A majority of the pregnant women were Malays (85.1%) in the age range of 18-43 years. According to pre-pregnancy Body Mass Index, 11.0%, 20.2% and 13.5% of them were underweight, overweight, and obese, respectively. About 30.1% of the women had at risk waist circumference (≥ 80cm). Meanwhile, the mean rate of weight gain was 0.38 kg/week for the second and third trimesters. Mean fasting plasma glucose (FPG) and two-hour plasma glucose (2hrPG) were 4.35 ± 0.47 mmol/l and 5.99 ± 1.56 mmol/l, respectively. About 10.6% and 8.9% of the women were hyperglycemic, less severe than GDM and GDM, respectively.

The mean energy intake of the pregnant women was 2,135 ± 686.26 kcal/day. The mean percentage of energy contributed by macronutrients was 51% by carbohydrate, 17% by protein and 32% by fat. While the mean intake of folate (47.09 ± 28.49% RNI) was below the recommended level, the mean intake of iron (108.18 ± 71.86% RNI) and calcium (116.52 ± 81.93% RNI) were slightly higher than the RNI recommendation. The mean for all food groups, except for grains and cereals, meat, poultry, and fish were less than the recommended servings. Three major dietary patterns were identified, namely "sweet and fatty food pattern", "healthy pattern" and "common food pattern". Most women consumed dietary supplements (82.6%) and did not consume alcohol (99.0%). None of them smoked. The mean daily total physical activity was 1005 minutes with a large majority of their time spent in household/caregiving activities (625 minutes/day). It may be concluded that Malaysian pregnant women are generally sedentary in their day-to-day activities, with only a small percentage being involved in sport activities or exercises.

One-fifth of infants (19.9%) were born via caesarean deliveries. The mean infant's length, head circumference and birth weight were 49.30 ± 2.58cm, 32.19 ± 1.44cm, and 3.03 ± 0.44kg respectively. More than half (56.4%) were born with a birth weight of 3.0–4.0 kg, while 9.2% were born weighing less than 2.5kg. For the birth weight percentile, 34% of infants were small-for-gestational-age (SGA), while only 10 infants (3.5%) were large-for-gestational-age (LGA).

Women with an excessive rate of gestational weight gain (GWG) at second trimester showed a higher risk of hyperglycemia. In terms of dietary intake, pregnant women with higher fat intake and high common food dietary pattern were 4 and 6 times more likely to be at risk of hyperglycemia. Only a high common food pattern was found to be significantly associated with the risk of GDM. For the pregnancy outcomes, caesarean delivery was the only one to be significantly associated with GDM.

The cut-off points for both FPG (4.8 mmol/l) and 2hPG (7.5 mmol/l) to detect adverse pregnancy outcomes were lower than the recommended criteria of MOH for diagnosis of GDM. Further well-designed clinical trials are needed to determine the cost-effectiveness of therapeutic strategies for management of hyperglycemia, less severe than GDM diagnosed by the present study on improving the adverse pregnancy outcomes. The rising prevalence of GDM in Malaysia and its adverse consequences underscore the need to identify the determinants for formulation of effective public

health strategies. Gestational weight gain and dietary intake should be the focus of the strategies as these lifestyle factors are linked to maternal hyperglycemia.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

FAKTOR PENENTU DAN HASIL KEHAMILAN YANG DISEBABKAN OLEH GLISEMIA IBU

Oleh

YONG HENG YAW

Julai 2017

Pengerusi : Profesor Zalilah Mohd Shariff, PhD
Fakulti : Perubatan dan Sains Kesihatan

Kedua-dua masalah diabetes gestasi (GDM) dan hiperglisemia kurang teruk berbanding GDM biasanya dikaitkan dengan risiko komplikasi kehamilan yang buruk. Kajian ini terdiri daripada dua fasa. Fasa pertama kajian adalah untuk menentukan titik potong hiperglisemia untuk mengesan komplikasi kehamilan yang buruk. Fasa kedua kajian adalah untuk menetukan faktor-faktor dan komplikasi kehamilan yang disebabkan oleh hyperglisemia ibu.

Fasa pertama kajian adalah kohort retrospektif yang melibatkan 1,356 wanita hamil yang berdaftar and menghadiri pemeriksaan antenatal di dua Klinik Kesihatan Ibu dan Anak (KKIA) di Daerah Seremban, Negeri Sembilan. Buku antenatal yang simpan di KKIA digunakan sebagai sumber data. Maklumat demografi dan sosioekonomi, obstetrik, antropometri, biokimia serta maklumat kelahiran bayi diambil. Hiperglisemia ditakrifkan sebagai salah satu atau kedua-dua kadar glukosa plasma berpuasa (FPG) 4.8 – 5.5 mmol/l atau kadar glukosa plasma 2 jam (2hPG) 7.5 – 7.7 mmol/l. GDM telah didiagnos mengikut kriteria Kementerian Kesihatan Malaysia (KKM) dengan salah satu atau kedua-dua FPG ≥ 5.6mmol/l atau 2hPG ≥ 7.8 mmol/l.

Fasa kedua kajian adalah kohort prospektif di mana seramai 282 wanita hamil dengan kadar glukosa darah normal telah diambil dari tiga KKIA di Daerah Seremban, Negeri Sembilan tindakan susulan dijalankan sampai bersalin. 75g Ujian Oral Toleransi Glukosa (OGTT) dilakukan antara minggu kehamilan ke 24 and 32. Maklumat antropometri sosio-demografi, biokimia, pemakanan, aktiviti fizikal, merokok, dan data lain dikumpulkan dengan menggunakan soal selidik yang telah dipra-uji dan ditemubual oleh penemuduga semasa sesi susulan. Maklumat kehamilan dan kelahiran bayi diperolehi daripada rekod perubatan.

Majoriti wanita hamil adalah Melayu (85.1%) dalam lingkungan umur 18–43 tahun. Menurut Indeks Jisim Badan pra-kehamilan, 11.0%, 20.2% dan 13.5% daripada mereka mengalami kekurangan berat badan, berlebihan berat badan dan obes, masing-masing. Sebanyak 30.1% daripada wanita mempunyai lilitan pinggang berrisiko (≥ 80cm). Sementara itu, kadar kenaikan berat badan semasa mengandung adalah 0.38 kg/minggu untuk trimester kedua dan ketiga kehamilan. Purata kadar glukosa plasma berpuasa (FPG) dan 2-jam glukosa plasma (2hrPG) adalah 4.35 ± 0.47 mmol/l dan 5.99 ± 1.56 mmol/l, masing-masing. Kira-kira 10.6% dan 8.9% daripada wanita hiperglisemia, kurang teruk daripada GDM dan GDM, masing-masing.

Purata pengambilan kalori wanita hamil adalah 2135 ± 686.26 kcal/hari. Purata peratusan kalori disumbangkan oleh makronutrien adalah 51% daripada karbohidrat, 17% daripada protein dan 32% daripada lemak. Walaupun purata pengambilan folat (47.09 ± 28.49% RNI) adalah di bawah tahap yang disarankan, tetapi purata pengambilan besi (108,18 ± 71,86% RNI) dan kalsium (116.52 ± 81.93% RNI) adalah lebih tinggi daripada saranan RNI. Purata pengambilan bagi semua kumpulan makanan, kecuali bijirin dan bijirin, daging, ayam, dan ikan kurang daripada bilangan hidangan yang disarankan. Tiga corak pemakanan utama telah dikenal pasti, dan dilabelkan sebagai "corak pengambilan makanan manis dan lemak', "corak pengambilan sihat" dan "corak pengambilan biasa". Kebanyakan wanita hamil (82.6%) mengambil suplemen diet dan tidak mengambil alkohol (99.0%). Tiada seorang pun daripada mereka merokok. Purata jumlah aktiviti fizikal harian adalah 1005 minit dengan majoriti menghabiskan masa dengnan aktiviti kerja rumah/mengasuh (625 minit sehari).

Satu per lima daripada bayi (19.9%) dilahirkan dengan cara pembedahan caesarean. Purata panjang, lilitan kepala dan berat badan lahir bayi 49.30 ± 2.58 cm, 32.19 ± 1.44 cm dan 3.03 ± 0.44 kg. Lebih daripada separuh (56.4%) bayi mempunyai berat badan lahir 3.0 – 4.0 kg, manakala 9.2% mempunyai berat badan lahir kurang dari 2.5 kg. Bagi persentil berat lahir, 34% bayi adalah kecil-untuk-umur getasi (SGA), manakala hanya 10 bayi (3.5%) besar-untuk-umur getasi (LGA).

Wanita dengan kadar kenaikan berat badan berlebihan di trimester kedua kehamilan menunjukkan risiko yang lebih tinggi untuk mengalami hiperglisemia. Dari segi pengambilan makanan, wanita hamil dengan pengambilan lemak tinggi, dan mempunyai corak makan biasa yang tinggi mempunyai 4 dan 6 kali lebih mudah mendapat hiperglisemia. Hanya corak makan biasa yang tinggi didapati berkaitan dengan risiko GDM. Bagi hasil kehamilan, bersalin dengan pembedahan caesaran merupakan satu-satunya hasil yang didapati signifikansi berkaitan dengan GDM.

Titik potongan untuk kedua-dua glukosa plasma berpuasa (FPG) (4.8 mmol/l) dan 2-jam glukosa plasma (2hrPG) (7.5 mmol/l) untuk mengesan komplikasi semasa kehamilan adalah lebih rendah daripada kriteria Kementerian Kesihatan Malaysia (KKM) untuk diagnos GDM. Kajian klinikal yang direka dengan baik amat diperlukan untuk menentukan keberkesanan kos strategi terapeutik untuk pengurusan

hiperglisemia, kurang teruk berbanding GDM disahkan oleh kajian ini untuk menurukan komplikasi semasa kehamilan. Peningkatan prevalen GDM di Malaysia dan komplikasi semasa kehamilan menekankan keperluan untuk mengenal pasti penentu dalam membentuk strategi kesihatan awam yang berkesan. Penambahan berat badan semasa mengandung, dan pengambilan makanan adalah tumpuan strategi kerana faktor-faktor gaya hidup dikaitkan dengan hiperglisemia ibu.

ACKNOWLEDGEMENTS

First of all, I am truly indebted to Prof. Dr. Zalilah Mohd Shariff, my supervisor, for her consistent coaching, guidance, experience-sharing and funding. Her thoughtfulness towards the educational welfare of her students has inspired me tremendously. Moreover, her patience and countless contribution in finishing this project were greatly appreciated.

Secondly, my heartfelt thanks to my co-supervisor, Assoc. Prof. Dr Barakatun Nisak Yusof and Dr. Zulida Rejali, for their assistance, expertise and suggestions to improve this research. Many thanks to all medical officers from MCH clinics in Seremban, Negeri Sembilan, for their assistance in providing me the patients and carriers samples that ensured the research went smoothly. Their generosity will not be forgotten. Next, I would like to acknowledge the supporting staffs from MCH clinics in Seremban, Negeri Sembilan, for assisting me a lot throughout this project. Not to be forgotten, I want to thank all the women who have voluntarily invested their time and effort to participate in my study.

My utmost gratitude to my colleague, Farah Yasmin and Cynthia, and others for their knowledge and assistance which has been very helpful in completing this research. I deeply acknowledged a bunch of my best friends, your kind understandings, encouragements and assistance throughout my study. We had shared many good and bad times; being there to support, comfort and cheer each other at times we were really stresses up throughout the study.

And last but not least, there is no words can be expressing my deepest gratitude to my beloved mother, husband and family members, because of you I am here today. Your endless supports, contributions and sacrifices would never be forgotten.

I certify that a Thesis Examination Committee has met on 31 July 2017 to conduct the final examination of Yong Heng Yaw on her thesis entitled "Determinants and Pregnancy Outcomes of Maternal Glycemia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

Hazizi bin Abu Saad, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Chan Yoke Mun, PhD
Senior Lecturer
Malaysian Research Institute On Ageing
Universiti Putra Malaysia
(Internal Examiner)

Loh Su Peng, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Abdullah Al Mamun, PhD
Associate Professor
University of Queensland
Australia
(External Examiner)

NOR AINI AB. SHUKOR, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 28 September 2017

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Zalilah Mohd Shariff, PhD
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Zulida Rejali, LRCP&SI, MB.BCh. B.A.O(NUI), MOG(UKM)
Medical Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Barakatun Nisak Mohd Yusof, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

ROBIAH BINTI YUNUS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: _____ Date:_____

Name and Matric No: Yong Heng Yaw (GS 29983)

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____
Name of Chairman of Supervisory Committee: Professor Dr. Zalilah Mohd Shariff

Signature: _____
Name of Member of Supervisory Committee: Dr. Zulida Rejali

Signature: _____
Name of Member of Supervisory Committee: Associate Professor Dr. Barakatun Nisak Mohd Yusof

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACHOIS	Australian Carbohydrate Intolerance Study in Pregnant Women
ACOG	American College of Obstetricians and Gynecologist
ADA	American Diabetes Association
AGEs	Advanced Glycation End Products
aHEL	alternate Health Eating Index
ALAD	Latin American Diabetes Association
ALSWH	Australian Longitudinal Study on Women's Health
aMed	alternate Mediterranean Diet
AUC	Area Under the Curve
BIGS	Born in Guangzhou Cohort Study
BMI	Body Mass Index
DASH	Dietary Approaches to Stop Hypertension
DBP	Diastolic Blood Pressure
DIP	Diabetes in Pregnancy
EI	Energy Intake
ER	Energy Requirement
FFQ	Food Frequency Questionnaire
FPG	Fasting Plasma Glucose
GCT	Glucose Challenge Test
GDM	Gestational Diabetes Mellitus
GI	Glycemic Index
GUSTO	Growing Up in Singapore Towards Healthy Outcomes
GWG	Gestational Weight Gain
HAPO	Hyperglycemia and Adverse Pregnancy Outcomes
HUSM	Hospital University Sains Malaysia

IADPSG	International Association of Diabetes in Pregnancy Study Groups
IGT	Impaired Glucose Tolerance
IHBR	Institute for Health Behavioral Research
IOM	Institute of Medicine
IPH	Institute of Public Health
LBW	Low birth weight
LGA	Large-for-Gestational Age
LMP	Last Menstruation Period
MET	Metabolic Equivalent
MCH	Maternal and Child Health
MDG	Malaysian Dietary Guideline
MOH	Ministry of Health
MREC	Medical Research Ethics Committee
MVPA	Moderate and Vigorous Physical Activity
NBW	Normal Birth Weight
NDDG	National Diabetes Data Group
NHANES	National Health and Nutrition Examination
NHMS	National Health and Morbidity Survey
NHS	Nurses' Health Study
NICE	National Institute for Health and Care Excellence
NOR	National Obstetric Registry
OGTT	Oral Glucose Tolerance Test
PINS	Pregnancy, Infection, and Nutrition Study
PPAQ	Pregnancy Physical Activity Questionnaire
PREGGIO	Pregnancy and Glycemic Index Outcomes
RNI	Recommended Nutrient Intakes

RR	Relative Risk
SBP	Systolic Blood Pressure
SECOST	Seremban Cohort Study
SGA	Small-for-Gestational Age
SNAP	Study of Nutrition and Pregnancy
STPM	Sijil Tinggi Pelajaran Malaysia
T2DM	Type 2 Diabetes Mellitus
TOP	Treatment of Obese Pregnant
UMMC	University Malaya Medical Centre
WATCH	Women and Their Children's Health
WC	Waist Circumference
WHO	World Health Organization
2hPG	2-hour Plasma Glucose

CHAPTER 1

INTRODUCTION

1.1 Background

Women undergo substantial physiological changes from the moment of conception until the process of delivery is completed. These physiological changes are typically seen in the cardiovascular, hematologic, endocrine, respiratory and renal systems. Metabolic alterations of glucose, protein and lipid are essential in order to meet the increased maternal and fetal demands. Normal physiology defines metabolism during the early pregnancy period, or the first 20 weeks of pregnancy, as a predominantly anabolic state with increased maternal fat stores and insulin secretion for increased peripheral glucose utilization (Lain & Catalano, 2007). The first half of pregnancy is basically the preparation period for rapid fetal growth, in which nutrients are being stored to meet fetal demands and to cope with late pregnancy and lactation (King, 2000).

In 2008, the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study reported that there were significant continuous associations between maternal hyperglycemia below the diagnostic criteria for gestational diabetes mellitus (GDM) with an increased risk for fetal size at birth, cesarean delivery, neonatal hypoglycemia and fetal hyperinsulinemia (Metzger et al., 2008). This study defined maternal hyperglycemia not amounting to GDM as a condition in which there is an excessive amount of glucose circulating in blood plasma but the concentration is not high enough to be classified as GDM. The findings of the HAPO study provided the impetus for the International Association of Diabetes in Pregnancy Study Groups (IADPSG) and the American Diabetes Association (ADA) to revise and subsequently recommend new lower diagnostic criteria for GDM (Panel, 2010). However, the use of the new criteria has resulted in a dramatic increase in the number of women diagnosed with GDM (Blackwell, 2012; Coustan, 2013; Cundy, Ackermann, & Ryan, 2014). With increased healthcare costs and the lack of improvement in maternal and infant outcomes as concomitant concerns, the optimal maternal glycemia threshold to diagnose GDM remains a controversial issue (Langer, Umans, & Miodovnik, 2013).

GDM is a common metabolic disorder defined as glucose intolerance with onset or first recognition during pregnancy (American Diabetes Association, 2003; Metzger & Coustan, 1998). Globally, the prevalence of GDM varies across populations. The rate of GDM worldwide is of an incremental trend, especially in developing countries. In Western countries, the reported prevalence ranges from 1–14% of all pregnancies (Coustan, 2012). In Malaysia, the prevalence of GDM is 8.7–24.9%, depending on ethnicity and geographical location (Idris, Hatikah, Murizah, & Rushdan, 2009; Jeganathan, Karalasingam, Man, Naidu, & Fadzi, 2011; Kwapisz & Bodaghi, 2013; Shamsuddin, Mahdy, Rafiaah, Jamil, & Rahimah, 2001; Tan, Ling, & Omar, 2007).

The National Health and Morbidity Survey (NHMS) reported that the prevalence of obesity in Malaysian women aged 18 years and older increased from 5.7% in 1996 to 17.6% in 2011 (IPH, 1996, 2015). The increasing rate of obesity within women of childbearing age is paralleled by the inevitable rise in the GDM rate. As more women become overweight or obese prior to pregnancy, their risks for maternal hyperglycemia and subsequently poor pregnancy outcomes are significantly greater.

There are non-modifiable risk factors and modifiable risk factors for GDM. Maternal obesity, gestational weight gain (GWG) and lifestyle behavior factors, particularly dietary intake, physical activity, sedentary behavior, alcohol and smoking are important modifiable risk factors of elevated maternal glucose level during pregnancy (Bowers et al, 2011; Metzger et al., 2007; Park et al., 2014; Tovar et al., 2009). Advanced maternal age, height, parity, ethnicity, family history of diabetes, history of GDM and history of other insulin-resistant conditions, such as metabolic syndrome and polycystic ovary syndrome, are non-modifiable risk factors for GDM (Al-Rowaily & Abolfotouh, 2010; Branchtein et al., 2000; Dornhorst & Rossi, 1998; Innes et al., 2002; Legro, Gnatuk, Kunselman, & Dunaif, 2005; Morikawa et al., 2012). There is still a lack of research on the factors associated with maternal hyperglycemia not amounting to GDM in pregnant women. GDM poses a risk to both mother and child. There is consensus that GDM is associated with a significant risk of adverse pregnancy outcomes. However, the risk of adverse pregnancy outcomes with maternal hyperglycemia less severe than GDM is less known (Metzger et al., 2008).

1.2 Statement of Problem

In 2013, the third edition of *The Perinatal Care Manual* published by the Ministry of Health (MOH) of Malaysia reported that GDM is diagnosed by both/either the fasting plasma glucose (FPG) ≥ 5.6mmol/l test and/or the two-hour plasma glucose (2hPG) ≥ 7.8mmol/l oral glucose tolerance test (OGTT) test (MOH of Malaysia, 2013). In 2015, the MOH of Malaysia reviewed the clinical practice guidelines (CPG) on the management of type 2 diabetes mellitus (T2DM) and proposed lower diagnostic criteria for GDM, having one or more abnormal value of FPG ≥ 5.1mmol/l, and 2hPG ≥ 7.8mmol/l in the OGTT (CPG, 2015). Both guidelines were derived by consensus of the taskforce members, using the findings from the literature, without any experimental study in the Malaysian population. However, whether these guidelines are applicable to pregnant women in areas of the world where women are substantially shorter or thinner than Western women are remains unknown.

Both maternal pre-pregnancy obesity and GWG are important modifiable risk factors of GDM. Obese pregnant women are more susceptible to GDM, as obesity increases the risk of glucose tolerance impairment (Pirjani et al., 2016; Scott-Pillai, Spence, Cardwell, Hunter, & Holmes, 2013). Women presenting with higher GWG are 2–2.54 times more at risk of impaired glucose tolerance in pregnancy (Herring et al., 2009; Saldana, Siega-Riz, Adair, & Suchindran, 2006). Furthermore, previous studies showed that the combination of pre-pregnancy obesity and excessive GWG will contribute to an even higher risk for negative pregnancy outcomes (Bowers et al., 2013;

Guelinckx, Devlieger, Beckers, & Vansant, 2008; Heude et al., 2012a). Although an optimal rate of GWG is associated with better maternal and fetal health outcomes, the actual rate of GWG defined as optimal remains controversial. At present, data on the rate of GWG and its association with GDM in Malaysian women are limited.

Maternal dietary intake during pregnancy, particularly higher intakes of energy and fat, could increase the risk for GDM (Bowers, Tobias, Yeung, Hu, & Zhang, 2012; Zhang & Ning, 2011). An adoption of the Western dietary pattern, which is characterized by high intakes of red meat, processed meats and refined foods, could also increase the risk of GDM (Zhang, Schulze, Solomon, & Hu, 2006). The major components of red meat and processed meat, such as saturated fat, cholesterol and heme iron, are associated with insulin resistance and subsequent risk of GDM (Qiu, Zhang, et al., 2011). Furthermore, high intakes of heme iron can result in high body iron stores, which may impair insulin sensitivity and glucose hemostasis (Aregbesola, Voutilainen, Virtanen, Mursu, & Tuomainen, 2013; Bao, Rong, Rong, & Liu, 2012). Most studies on dietary pattern have been limited to Western populations. As there are differences in diet and lifestyle behaviors, the dietary pattern of Malaysian pregnant women could be different from that reported in Western populations.

Apart from dietary intake, physical activity level, sedentary behavior, alcohol consumption and smoking are other lifestyle factors associated with GDM. Pregnant women in the high quartile of moderate-intensity activity and occupational activity during early pregnancy had about a 50% decreased risk of abnormal glucose tolerance (Chasan-Taber et al., 2014). Smoking has been associated with an increased risk of central obesity or abdominal fat, which is an established risk factor for insulin resistance and diabetes (Hu, 2011). It is well established that excessive alcohol drinking and smoking are associated with insulin resistance and T2DM (Dode & dos Santos, 2009; Pietraszek, Gregersen, & Hermansen, 2010; Zhang et al., 2011); however, the role of alcohol drinking and smoking in the risk of GDM remains unknown. Besides, little is known about the actual lifestyle patterns, particularly physical activity level, alcohol consumption and smoking, of Malaysian pregnant women.

Many studies have established that women with GDM are more predisposed to poor pregnancy outcomes, such as cesarean delivery, pregnancy-induced hypertension and preeclampsia (Catalano et al., 2012; Lowe et al., 2012; Nordin, Wei, Naing, & Symonds, 2006). These new mothers are more likely to give birth to asphyxiated, hypoglycemic or large-for-gestational age (LGA) infants (Leary, Pettitt, & Jovanovič, 2010; Lowe et al., 2012; Polin, Fox, & Abman, 2011). These conditions can subsequently cause other long-term health problems to the child, such as obesity, T2DM, cancer and cardiovascular disease in later life. GDM mothers themselves are more susceptible to developing cardiovascular disease and overt diabetes, particularly T2DM, during the ensuing courses of their lives (Carr et al., 2006; Gilmartin, Ural, & Repke, 2008; Negrato & Gomes, 2013). General consensus associates GDM with a significant risk of adverse pregnancy outcomes. However, the risk of adverse

pregnancy outcomes associated with maternal hyperglycemia less severe than GDM is still controversial.

To date, optimal diagnostic criteria to detect GDM are of much debate. In Malaysia, the GDM diagnostic criteria were derived by consensus of the taskforce members, using the findings from the literature (MOH, 2013). Epidemiological differences of maternal hyperglycemia between Asian and Western populations may inevitably result in different distributions of maternal glycemia during pregnancy. However, such information in Malaysia is unavailable at present. Previous studies have shown that GDM can have immediate and long-term health risks to women and offspring (Carr et al., 2006; Catalano et al., 2012; Innes et al., 2002; Ismail et al., 2011; Leary et al., 2010; Lowe et al., 2012; Nordin et al., 2006). The risk of adverse pregnancy outcomes of maternal hyperglycemia less severe than GDM, which is characterized by an intermediate glucose tolerance value between normal and GDM, as well as its associated factors, remains unclear.

Thus, this study aims to address the following questions:

i. What is the distribution of maternal glycemia during pregnancy among Malaysian pregnant women?
ii. What is the cut-off for maternal hyperglycemia for the detection of adverse pregnancy outcomes?
iii. What are the lifestyle behaviors (dietary intake, physical activity level, sedentary behaviors, smoking and alcohol) and gestational weight gain of women during pregnancy?
iv. Is there any relationship between socio-demographic factors, obstetrical factors, lifestyle behaviors and gestational weight gain with maternal glycemia?
v. Is there any relationship between maternal glycemia and pregnancy outcomes?

1.3 Objectives of Study

General Objective

To identify the determinants and pregnancy outcomes of maternal hyperglycemia

Specific Objectives

Phase 1 study

1. To determine the cut-off for maternal hyperglycemia for adverse pregnancy outcome detection
2. To identify the distribution of maternal glycemia during pregnancy among Malaysian pregnant women

Phase 2 study

1. To assess
    a. socio-demographic factors
    b. obstetrical factors
    c. lifestyle behaviors
    d. weight gain

    of women during pregnancy
2. To determine the relationship between
    a. socio-demographic factors
    b. obstetrical factors
    c. lifestyle behaviors
    d. weight gain

    and maternal glycemia
3. To determine the relationship between maternal glycemia and pregnancy outcomes

1.4 Study Hypotheses

The hypotheses tested in this study are:

1. There are significant associations between socio-demographic factors, obstetrical factors, lifestyle behaviours and gestational weight gain with maternal hyperglycemia.
2. There are significant associations between maternal hyperglycemia and adverse pregnancy outcomes.

1.5 Research Framework

The research framework for this study is presented in Figure 1.1. This study consisted of two phases. Phase 1 was a retrospective study and phase 2 was a prospective study. Phase 1 of study focused on determining the maternal hyperglycemia cut-off for detection of adverse pregnancy outcomes. The resulting findings were then used for sample size calculation and defined the maternal hyperglycemia cut-off for the second phase of the study. Maternal glycemia was then classified into 3 groups, namely normal glycemia, hyperglycemia less severe than GDM and GDM.

The present study examined 3 groups of independent factors, namely demographic and socioeconomic, obstetrical, and lifestyle factors. Studies have shown that advanced maternal age was associated with increased risks of hyperglycemia (Morikawa et al., 2012). Socio-economic status was also established as a contributing factor to GDM incidence (El-Hazmi & Warsy, 2000; Keshavarz et al., 2005), with Keshavarz et al. (2005) showed that lower socio-economic status was associated with the development of GDM. These differences in socio-economic statuses did not pertain to lifestyle behaviors only; it also encompassed factors of general health, awareness, education and accessibility to medical care.

Several studies found that the risk of maternal hyperglycemia was substantially increased with maternal body mass index (BMI) (Chu et al., 2007; Farah et al., 2012; Teh et al., 2011). Previous history of GDM has been acknowledged as one of the strongest predictors of GDM, with the GDM recurrence rates of 48% (Schwartz, Nachum, & Green, 2015). Additionally, there was growing evidences suggest that unhealthy lifestyle behaviors (dietary intake, physical inactivity, sedentary behaviors, alcohol and smoking) during pregnancy were significant determinants of hyperglycemia (Chasan-Taber et al., 2014; Khosravi-Boroujeni et al., 2012; Malik, Popkin, & Bray, 2010; Risérus, Willett, & Hu, 2009). Smoking in particular has been associated with increased risk of central obesity, which was an established risk factor for insulin resistance and diabetes (Hu, 2011).

Maternal hyperglycemia was associated with increased placental transfer of glucose, resulting in an increase in insulin mediated fetal growth and pregnancy complications. Maternal hyperglycemia has been reported to be a predictor of caesarean section and macrosomia (Wahi et al., 2011; Yang et al., 2002). The pregnancy outcomes explored in this study were mode of delivery, birth weight, and fetal size (SGA and LGA).

Phase 1 (Retrospective study)

To determine maternal hyperglycemia cut-off for detection of adverse pregnancy

Phase 2 (Prospective study)

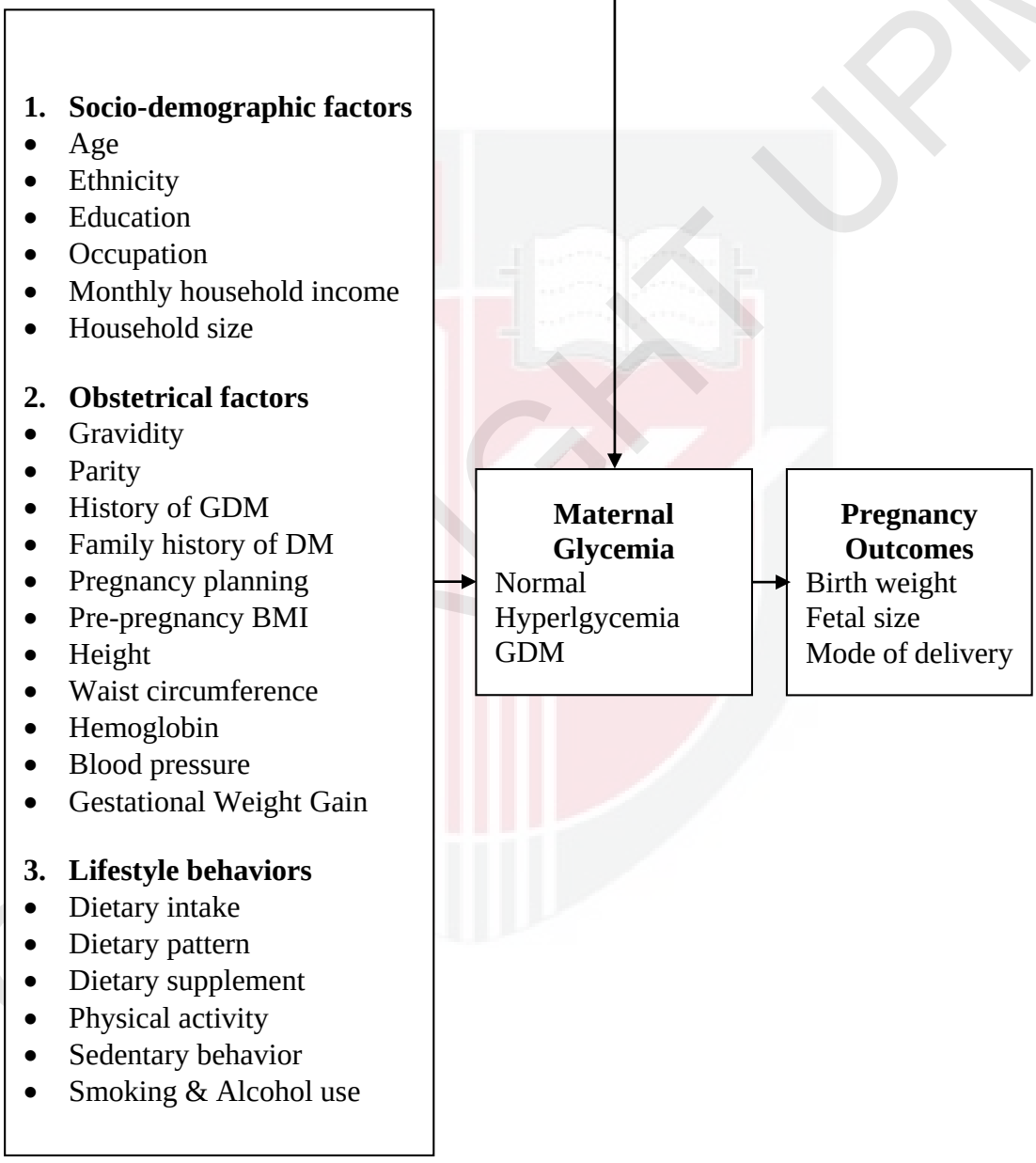

Figure 1.1 : Research framework

1.6 Importance of Study

The rising worldwide prevalence of diabetes mellitus (DM), particularly in developing countries, is worrisome, as nearly 382 million adults aged 18 years and older are afflicted by it (Aguiree, Brown, Cho, & Dahlquist, 2013). In Malaysia, the NHMS 2015 showed that the prevalence of DM increased from 11.6% in 2006 to 18.3% in 2015 (3.6 million) (IPH, 2006, 2015). If the current trend continues, Malaysia is predicted to double the percentage to 30% by 2030, which amounts to 5 million diabetic patients. As diagnosis of GDM is associated with an increased risk of maternal DM during the later course of life, maternal hyperglycemia or GDM necessitates primary prevention steps to be taken to ensure both maternal and fetal well-being. This study will contribute to the existing literature on maternal hyperglycemia during pregnancy.

The HAPO study established a strong association between maternal hyperglycemia below levels diagnostic of GDM with an increased risk of adverse pregnancy outcomes. However, no clear threshold showing the level of maternal hyperglycemia that dramatically increases the risk for poor pregnancy outcomes is currently available. Furthermore, understanding the different levels of maternal hyperglycemia associated with adverse pregnancy outcomes is crucial. It could influence T2DM-screening protocols and identify populations at risk of adverse perinatal and long-term offspring outcomes. This is the first study in Malaysia to quantify the relationship between maternal glucose levels and pregnancy outcomes.

Healthy lifestyle behaviours, specifically dietary intake and physical activity, have long since been associated with successful pregnancy. Despite Loy and Hamid's (2013) study on pregnant women's dietary intake, physical activity, sedentary lifestyle, smoking and alcohol consumption during pregnancy in Malaysia is an uncharted field of knowledge. Thus, developing a profile for pregnant women's lifestyle could initiate the identification of appropriate interventions to improve pregnancy outcomes according to needs and resources. This may enhance awareness on nutrition and GWG status during pregnancy for these mothers-to-be and be a source of motivation in achieving the recommended GWG through lifestyle behavior changes, particularly through diet and physical activity. Governmental bodies and related agencies, such as the MOH and the Ministry of Women and Family Development, could also find it beneficial for policy and program development.

The effects of excessive GWG or inadequate GWG have been frequently reported, but most data are exclusively from Western populations. Differences in population characteristics (demographics, socioeconomics, culture and health) between Asian and Western countries may influence patterns of GWG. However, data on GWG specifically applicable for Malaysian women are non-existent at present. As determining GWG could significantly prevent adverse maternal and child health outcomes, the anticipated findings could help in addressing inappropriate GWG during pregnancy. Effective strategies should be developed to focus on the high-risk population (those presenting with excessive or inadequate GWG) via lifestyle

adjustment. These findings could also provide information that rejects or supports the findings of previous studies.

Maternal hyperglycemia also amplifies the risk of complications during pregnancy. Women presenting with poor pregnancy outcomes are often saddled with higher healthcare expenditure than their peers with normal pregnancies. A large proportion of such expenses are attributable to treatments for complications of pregnancy, such as low birth weight (LBW). As well-controlled glycemic levels keep these complications at bay, early diagnosis and prompt treatment of maternal hyperglycemia will lessen both visible and hidden medical costs. This form of primary prevention strategy would prove to be very cost-effective, particularly for developing countries like Malaysia.

1.7 Definition of Terms

1. Hyperglycemia, less severe than GDM is defined as high blood sugar in which an excessive amount of glucose circulates in the blood plasma but not high enough to be classified as GDM (Metzger et al., 2008).
2. Gestational diabetes mellitus (GDM) is defined as glucose intolerance in the second or third trimester of pregnancy that is not clearly overt diabetes (American Diabetes Association, 2015).

REFERENCES

Abdullahi, H., Gasim, G. I., Saeed, A., Imam, A. M., & Adam, I. (2014). Antenatal iron and folic acid supplementation use by pregnant women in Khartoum, Sudan. *BMC Research Notes*, *7*(1), 498. http://doi.org/10.1186/1756-0500-7-498

Abouzeid, M., Versace, V. L., Janus, E. D., Davey, M. A., Philpot, B., Oats, J., & Dunbar, J. A. (2015). Socio-cultural disparities in GDM burden differ by maternal age at first delivery. *PLoS ONE*, *10*(2). http://doi.org/10.1371/journal.pone.0117085

ACOG. (2016). Practice Bulletin No. 173. Fetal macrosomia. *Obstetrics & Gynecology*, *128*(5), 1191–1192. http://doi.org/10.1097/AOG.0000000000001229

Aguiree, F., Brown, A., Cho, N., & Dahlquist, G. (2013). *IDF Diabetes Atlas* (Sixth). International Diabetes Federation. http://doi.org/10.1016/j.diabres.2009.10.007

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett, D. R., Tudor-Locke, C., … Leon, A. S. (2011). 2011 compendium of physical activities: A second update of codes and MET values. *Medicine and Science in Sports and Exercise*, *43*(8), 1575–1581. http://doi.org/10.1249/MSS.0b013e31821ece12

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J., … Leon, A. S. (2000). Compendium of physical activities: an update of activity codes and MET intensities. *Medicine and Science in Sports and Exercise*, *32*(9 Suppl), S498–S504. http://doi.org/10.1097/00005768-200009001-00009

Aktün, H. L., Uyan, D., Yorgunlar, B., & Acet, M. (2015). Gestational diabetes mellitus screening and outcomes. *Journal of the Turkish German Gynecology Association*, *16*(1), 25–29. http://doi.org/10.5152/jtgga.2015.15081

Al-Noaemi, M., & Shalayel, M. (2011). Pathophysiology of Gestational Diabetes Mellitus: The Past, the Present and the Future. *Gestational Diabetes*, *1*, 91–114. http://doi.org/10.5772/24315

Al-Rowaily, M. A., & Abolfotouh, M. A. (2010). Predictors of gestational diabetes mellitus in a high-parity community in Saudi Arabia. *Eastern Mediterranean Health Journal = La Revue de Sante de La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, *16*(6), 636–641.

Alwan, N. A., Greenwood, D. C., Simpson, N. A. B., McArdle, H. J., & Cade, J. E. (2010). The relationship between dietary supplement use in late pregnancy and birth outcomes: a cohort study in British women. *BJOG : An International Journal of Obstetrics and Gynaecology*, *117*(7), 821–9. http://doi.org/10.1111/j.1471-0528.2010.02549.x

American College of, O., & Gynecologists. (2013). ACOG Committee opinion no. 549: obesity in pregnancy. *Obstet Gynecol*, *121*(1), 213–217. http://doi.org/http://10.1097/01.AOG.0000425667.10377.60

American Diabetes Association. (2004). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*, *27*(Supplement 1), S5–S10. http://doi.org/10.2337/diacare.27.2007.S5

American Diabetes Association. (2015). 2. Classification and Diagnosis of Diabetes. *Diabetes Care*, *38*(Supplement 1), S8 LP-S16. Retrieved from http://care.diabetesjournals.org/content/38/Supplement_1/S8.abstract

American Diabetes Association, A. D., Dabelea, D., Rewers, A., Stafford, J., Cowie, C., Rust, K., … Coustan, D. (2016). 2. Classification and Diagnosis of Diabetes. *Diabetes Care*, *39 Suppl 1*(Supplement 1), S13-22. http://doi.org/10.2337/dc16-S005

Anastasiou, E., Alevizaki, M., Grigorakis, S. J., Philippou, G., Kyprianou, M., & Souvatzoglou, A. (1998). Decreased stature in gestational diabetes mellitus. *Diabetologia*, *41*(9), 997–1001. http://doi.org/10.1007/s001250051022

Anna, V., van der Ploeg, H. P., Cheung, N. W., Huxley, R. R., & Bauman, A. E. (2008). Sociodemographic correlates of the increasing trend in prevalence of gestational diabetes mellitus in a large population of women between 1995 and 2005. *Diabetes Care*, *31*(12), 2288–2293. Journal Article. http://doi.org/10.2337/dc08-1038

Anoon, S. S., Rizk, D. E. E., & Ezimokhai, M. (2003). Obstetric outcome of excessively overgrown fetuses (≥ 5000 g): A case-control study. *Journal of Perinatal Medicine*, *31*(4), 295–301. http://doi.org/10.1515/JPM.2003.041

Anzaku, A. S., & Musa, J. (2013). Prevalence and associated risk factors for gestational diabetes in Jos, North-central, Nigeria. *Archives of Gynecology and Obstetrics*, *287*(5), 859–863. http://doi.org/10.1007/s00404-012-2649-z

Aregbesola, A., Voutilainen, S., Virtanen, J. K., Mursu, J., & Tuomainen, T. P. (2013). Body iron stores and the risk of type 2 diabetes in middle-aged men. *Eur J Endocrinol*, *169*(2), 247–253. http://doi.org/10.1530/EJE-13-0145

Asemi, Z., Karamali, M., & Esmaillzadeh, A. (2014). Effects of calcium-vitamin D co-supplementation on glycaemic control, inflammation and oxidative stress in gestational diabetes: A randomised placebo-controlled trial. *Diabetologia*, *57*(9), 1798–1806. http://doi.org/10.1007/s00125-014-3293-x

Asemi, Z., Samimi, M., Tabassi, Z., & Esmaillzadeh, A. (2014). The effect of DASH diet on pregnancy outcomes in gestational diabetes: a randomized controlled clinical trial. *European Journal of Clinical Nutrition*, *68*(4), 490–495. http://doi.org/10.1038/ejcn.2013.296

Atkinson, F. S., Foster-Powell, K., & Brand-Miller, J. C. (2008). International tables of glycemic index and glycemic load values: 2008. *Diabetes Care*, *31*(12), 2281–2283. http://doi.org/10.2337/dc08-1239

Baci, Y., Ustuner, I., Keskin, H. L., Ersoy, R., & Avsar, A. F. (2013). Effect of maternal obesity and weight gain on gestational diabetes mellitus. *Gynecol Endocrinol*, *29*(2), 133–136. http://doi.org/10.3109/09513590.2012.730571

Baliunas, D. O., Taylor, B. J., Irving, H., Roerecke, M., Patra, J., Mohapatra, S., & Rehm, J. (2009). Alcohol as a risk factor for type 2 diabetes: A systematic review and meta-analysis. *Diabetes Care*, *32*(11), 2123–2132. http://doi.org/10.2337/dc09-0227

Bánhidy, F., Ács, N., Puhó, E. H., & Czeizel, A. E. (2011). Iron deficiency anemia: Pregnancy outcomes with or without iron supplementation. *Nutrition*, *27*(1), 65–72. http://doi.org/10.1016/j.nut.2009.12.005

Bao, W., Bowers, K., Tobias, D. K., Hu, F. B., & Zhang, C. (2013). Prepregnancy dietary protein intake, major dietary protein sources, and the risk of gestational diabetes mellitus: A prospective cohort study. *Diabetes Care*, *36*(7), 2001–2008. http://doi.org/10.2337/dc12-2018

Bao, W., Bowers, K., Tobias, D. K., Olsen, S. F., Chavarro, J., Vaag, A., … Zhang, C. (2014). Prepregnancy low-carbohydrate dietary pattern and risk of gestational diabetes mellitus: a prospective cohort study. *The American Journal of Clinical Nutrition*, *99*(6), 1378–1384. http://doi.org/10.3945/ajcn.113.082966

Bao, W., Rong, Y., Rong, S., & Liu, L. (2012). Dietary iron intake, body iron stores, and the risk of type 2 diabetes: a systematic review and meta-analysis. *BMC Medicine*, *10*(1), 119. http://doi.org/10.1186/1741-7015-10-119

Bao, W., Tobias, D. K., Bowers, K., Chavarro, J., Vaag, A., Grunnet, L. G., … Zhang, C. (2014). Physical activity and sedentary behaviors associated with risk of progression from gestational diabetes mellitus to type 2 diabetes mellitus: a prospective cohort study. *JAMA Internal Medicine*, *174*(7), 1047–55. http://doi.org/10.1001/jamainternmed.2014.1795

Baptiste-Roberts, K., Ghosh, P., & Nicholson, W. K. (2011). Pregravid physical activity, dietary intake, and glucose intolerance during pregnancy. *Journal of Women's Health*, *20*(12), 1847–51. http://doi.org/10.1089/jwh.2010.2377

Barakat, R., Cordero, Y., Coteron, J., Luaces, M., & Montejo, R. (2012). Exercise during pregnancy improves maternal glucose screen at 24-28 weeks: a randomised controlled trial. *British Journal of Sports Medicine*, *46*(9), 656–661. http://doi.org/10.1136/bjsports-2011-090009

Barakat, R., Pelaez, M., Lopez, C., Lucia, A., & Ruiz, J. R. (2013). Exercise during pregnancy and gestational diabetes-related adverse effects: a randomised controlled trial. *British Journal of Sports Medicine*, *47*(10), 630–6. http://doi.org/10.1136/bjsports-2012-091788

Barakat, R., Perales, M., Bacchi, M., Coteron, J., & Refoyo, I. (2014). A program of exercise throughout pregnancy. is it safe to mother and newborn? *American Journal of Health Promotion*, *29*(1), 2–8. http://doi.org/10.4278/ajhp.130131-QUAN-56

Barakatun Nisak Mohd Yusof, Ruzita Abd. Talib, Norimah A.Karim, Nor Azmi Kamarudin, & Fatimah Arshad. (2009). Glycaemic index of four commercially available breads in Malaysia. *International Journal of Food Sciences and Nutrition*, *60*(6), 487–96. http://doi.org/10.1080/09637480701804268

Baron, R., Manniën, J., te Velde, S. J., Klomp, T., Hutton, E. K., & Brug, J. (2015). Socio-demographic inequalities across a range of health status indicators and health behaviours among pregnant women in prenatal primary care: a cross-sectional study. *BMC Pregnancy and Childbirth*, *15*(1), 261. http://doi.org/10.1186/s12884-015-0676-z

Barthélémy, T., Andy, M., & Roger, M. (2011). Effect of maternal alcohol consumption on gestational diabetes detection and mother-infant's outcomes in Kinshasa, DR Congo. *Open Journal of Obstetrics and Gynecology*, *1*(4), 208–212. http://doi.org/doi: 10.4236/ojog.2011.14040.

Bastard, J. P., Jardel, C., Bruckert, E., Blondy, P., Capeau, J., Laville, M., … Hainque, B. (2000). Elevated levels of interleukin 6 are reduced in serum and subcutaneous adipose tissue of obese women after weight loss. *The Journal of Clinical Endocrinology and Metabolism*, *85*(9), 3338–42. http://doi.org/10.1210/jcem.85.9.6839

Bastide, N. M., Pierre, F. H. F., & Corpet, D. E. (2011). Heme iron from meat and risk of colorectal cancer: A meta-analysis and a review of the mechanisms involved. *Cancer Prevention Research*. http://doi.org/10.1158/1940-6207.CAPR-10-0113

Basu, S., Rathore, P., & Bhatia, B. D. (2008). Predictors of mortality in very low birth weight neonates in India. *Singapore Med J*, *49*(7), 556–560. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18695864

Bellamy, L., Casas, J.-P., Hingorani, A. D., & Williams, D. (2009). Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. *The Lancet*, *373*(9677), 1773–1779. http://doi.org/10.1016/S0140-6736(09)60731-5

Bener, A., Salameh, K. M. K., Yousafzai, M. T., & Saleh, N. M. (2012). Pattern of Maternal Complications and Low Birth Weight: Associated Risk Factors among Highly Endogamous Women. *ISRN Obstetrics and Gynecology*, *2012*, 1–7. http://doi.org/10.5402/2012/540495

Blumfield, M., Hure, A., MacDonald-Wicks, L., Smith, R., Simpson, S., Raubenheimer, D., & Collins, C. (2012). The association between the macronutrient content of maternal diet and the adequacy of micronutrients during pregnancy in the women and their children's health (WATCH) study. *Nutrients*, *4*(12), 1958–1976. http://doi.org/10.3390/nu4121958

Blumfield, M. L., Schreurs, M., Rollo, M. E., Macdonald-Wicks, L. K., Kokavec, A., & Collins, C. E. (2016). The association between portion size, nutrient intake and gestational weight gain: A secondary analysis in the WATCH study 2006/7. *Journal of Human Nutrition and Dietetics*, *29*(3), 271–280. http://doi.org/10.1111/jhn.12330

Bo, S., Menato, G., Villois, P., Gambino, R., Cassader, M., Cotrino, I., & Cavallo-Perin, P. (2009). Iron supplementation and gestational diabetes in midpregnancy. *American Journal of Obstetrics and Gynecology*, *201*(2). http://doi.org/10.1016/j.ajog.2009.04.049

Boden, G., Chen, X., Ruiz, J., White, J. V., & Rossetti, L. (1994). Mechanisms of fatty acid-induced inhibition of glucose uptake. *Journal of Clinical Investigation*, *93*(6), 2438–2446. http://doi.org/10.1172/JCI117252

Bolognani, C. V, de Sousa Moreira Reis, L. B., de Souza, S. S., Dias, A., Rudge, M. V, & de Mattos Paranhos Calderon, I. (2014). Waist circumference in predicting gestational diabetes mellitus. *J Matern Fetal Neonatal Med*, *27*(9), 943–948. http://doi.org/10.3109/14767058.2013.847081

Boo, N. Y., Lim, S. M., Koh, K. T., Lau, K. F., & Ravindran, J. (2008). Risk factors associated with low birth weight infants in the Malaysian population. *Med J Malaysia*, *63*(4), 306–10. Retrieved from http://www.researchgate.net/publication/24348819_Risk_factors_associated_with_low_birth_weight_infants_in_the_Malaysian_population

Boriboonhirunsarn, D., & Waiyanikorn, R. (2016). Emergency cesarean section rate between women with gestational diabetes and normal pregnant women. *Taiwanese Journal of Obstetrics and Gynecology*, *55*(1), 64–67. http://doi.org/10.1016/j.tjog.2015.08.024

Boulet, S. L., Alexander, G. R., Salihu, H. M., & Pass, M. (2003). Macrosomic births in the United States: Determinants, outcomes, and proposed grades of risk. *American Journal of Obstetrics and Gynecology*, *188*(5), 1372–1378. http://doi.org/10.1067/mob.2003.302

Bowers, K., Laughon, S. K., Kiely, M., Brite, J., Chen, Z., & Zhang, C. (2013). Gestational diabetes, pre-pregnancy obesity and pregnancy weight gain in relation to excess fetal growth: Variations by race/ethnicity. *Diabetologia*, *56*(6), 1263–1271. http://doi.org/10.1007/s00125-013-2881-5

Bowers, K., Tobias, D. K., Yeung, E., Hu, F. B., & Zhang, C. (2012). A prospective study of prepregnancy dietary fat intake and risk of gestational diabetes. *The American Journal of Clinical Nutrition*, *95*(2), 446–453. http://doi.org/10.3945/ajcn.111.026294

Bowers, K., Yeung, E., Williams, M. A., Qi, L., Tobias, D. K., Hu, F. B., & Zhang, C. (2011). A prospective study of prepregnancy dietary iron intake and risk for gestational diabetes mellitus. *Diabetes Care*, *34*(7), 1557–1563. http://doi.org/10.2337/dc11-0134

Branchtein, L., Schmidt, M. I., Matos, M. C. G., Yamashita, T., Pousada, J. M. D. C., & Duncan, B. B. (2000). Short stature and gestational diabetes in Brazil. *Diabetologia*. http://doi.org/10.1007/s001250051460

Branum, A. M., Bailey, R., & Singer, B. J. (2013). Dietary supplement use and folate status during pregnancy in the United States. *The Journal of Nutrition*, *143*(4), 486–92. http://doi.org/10.3945/jn.112.169987

Brawarsky, P., Stotland, N. E., Jackson, R. A., Fuentes-Afflick, E., Escobar, G. J., Rubashkin, N., & Haas, J. S. (2005). Pre-pregnancy and pregnancy-related factors and the risk of excessive or inadequate gestational weight gain. *International Journal of Gynecology and Obstetrics*, *91*(2), 125–131. http://doi.org/10.1016/j.ijgo.2005.08.008

Breen, C., Ryan, M., Gibney, M. J., Corrigan, M., & O'Shea, D. (2013). Glycemic, Insulinemic, and Appetite Responses of Patients With Type 2 Diabetes to Commonly Consumed Breads. *The Diabetes Educator*, *39*(3), 376–386. http://doi.org/10.1177/0145721713479675

Brite, J., Shiroma, E. J., Bowers, K., Yeung, E., Laughon, S. K., Grewal, J. G., & Zhang, C. (2014). Height and the risk of gestational diabetes: Variations by race/ethnicity. *Diabetic Medicine*, *31*(3), 332–340. http://doi.org/10.1111/dme.12355

Broussard, C. S., Louik, C., Honein, M. A., & Mitchell, A. A. (2010). Herbal use before and during pregnancy. *American Journal of Obstetrics and Gynecology*, *202*(5). http://doi.org/10.1016/j.ajog.2009.10.865

Buchanan, T. A. (1991). Glucose metabolism during pregnancy: normal physiology and implications for diabetes mellitus. *Israel Journal of Medical Sciences*, *27*(8–9), 432–441.

Buckley, B. S., Harreiter, J., Damm, P., Corcoy, R., Chico, A., Simmons, D., … Dunne, F. (2012). Gestational diabetes mellitus in Europe: Prevalence, current screening practice and barriers to screening. A review. *Diabetic Medicine*. http://doi.org/10.1111/j.1464-5491.2011.03541.x

Callaway, L. K., Colditz, P. B., Byrne, N. M., Lingwood, B. E., Rowlands, I. J., Foxcroft, K., & McIntyre, H. D. (2010). Prevention of gestational diabetes: Feasibility issues for an exercise intervention in obese pregnant women. *Diabetes Care*, *33*(7), 1457–1459. http://doi.org/10.2337/dc09-2336

Carolan, M. (2013). Gestational diabetes mellitus among women born in South East Asia: A review of the evidence. *Midwifery*, *29*(9), 1019–1026. http://doi.org/10.1016/j.midw.2012.09.003

Carolan, M., Davey, M.-A., Biro, M. A., & Kealy, M. (2012). Maternal age, ethnicity and gestational diabetes mellitus. *Midwifery*, *28*(6), 778–783. http://doi.org/10.1016/j.midw.2011.08.014

Carpenter, M. W., & Coustan, D. R. (1982). Criteria for screening tests for gestational diabetes. *Am J Obstet Gynecol*, *144*(7), 768–773.

Carr, D. B., Utzschneider, K. M., Hull, R. L., Tong, J., Wallace, T. M., Kodama, K., … Group, the A. D. A. G. S. (2006). Gestational Diabetes Mellitus Increases the Risk of Cardiovascular Disease in Women With a Family History of Type 2 Diabetes. *Diabetes Care* , *29*(9), 2078–2083. http://doi.org/10.2337/dc05-2482

Carreno, C. A., Clifton, R. G., Hauth, J. C., Myatt, L., Roberts, J. M., Spong, C. Y., … Sorokin, Y. (2012). Excessive early gestational weight gain and risk of gestational diabetes mellitus in nulliparous women. *Obstetrics and Gynecology*, *119*(6), 1227–33. http://doi.org/10.1097/AOG.0b013e318256cf1a

Castro, A. V. B., Kolka, C. M., Kim, S. P., & Bergman, R. N. (2014). Obesity, insulin resistance and comorbidities? Mechanisms of association. *Arquivos Brasileiros de Endocrinologia E Metabologia*, *58*(6), 600–9. http://doi.org/10.1590/0004-2730000003223

Catalano, P. M., McIntyre, H. D., Cruickshank, J. K., McCance, D. R., Dyer, A. R., Metzger, B. E., … Oats, J. J. N. (2012). The hyperglycemia and adverse pregnancy outcome study: Associations of GDM and obesity with pregnancy outcomes. *Diabetes Care*, *35*(4), 780–786. http://doi.org/10.2337/dc11-1790

Catalano, P. M., Tyzbir, E. D., Roman, N. M., Amini, S. B., & Sims, E. A. H. (1991). Longitudinal changes in insulin release and insulin resistance in nonobese pregnant women. *American Journal of Obstetrics & Gynecology*, *165*(6), 1667–1672. http://doi.org/10.1016/0002-9378(91)90012-G

Catalano, P. M., Tyzbir, E. D., Wolfe, R. R., Calles, J., Roman, N. M., Amini, S. B., & Sims, E. A. (1993). Carbohydrate metabolism during pregnancy in control subjects and women with gestational diabetes. *The American Journal of Physiology*, *264*(1 Pt 1), E60–E67. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8430789

Cavicchia, P. P., Liu, J., Adams, S. A., Steck, S. E., Hussey, J. R., Daguise, V. G., & Hebert, J. R. (2014). Proportion of gestational diabetes mellitus attributable to overweight and obesity among non-Hispanic black, non-Hispanic white, and Hispanic women in South Carolina. *Maternal and Child Health Journal*, *18*(8), 1919–1926. Journal Article, Research Support, N.I.H., Extramural. http://doi.org/10.1007/s10995-014-1437-8

Chan, K. K. L., Chan, B. C. P., Lam, K. F., Tam, S., & Lao, T. T. (2009). Iron supplement in pregnancy and development of gestational diabetes - A randomised placebo-controlled trial. *BJOG: An International Journal of Obstetrics and Gynaecology*, *116*(6), 789–797. http://doi.org/10.1111/j.1471-0528.2008.02014.x

Chandonnet, N., Saey, D., Alméras, N., & Marc, I. (2012). French pregnancy physical activity questionnaire compared with an accelerometer cut point to classify physical activity among pregnant obese women. *PLoS ONE*, *7*(6). http://doi.org/10.1371/journal.pone.0038818

Chang, H. Y., Keyes, K. M., Lee, K.-S., Choi, I. A., Kim, S. J., Kim, K. W., … Shin, Y.-J. (2014). Prenatal maternal depression is associated with low birth weight through shorter gestational age in term infants in Korea. *Early Human Development*, *90*(1), 15–20. http://doi.org/10.1016/j.earlhumdev.2013.11.006

Chasan-Taber, L., Schmidt, M. D., Pekow, P., Sternfeld, B., Manson, J. E., Solomon, C. G., … Markenson, G. (2008). Physical activity and gestational diabetes mellitus among hispanic women. *Journal of Women's Health*, *17*(6), 999–1008. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-49149103970&partnerID=40&md5=8fc8c24f56eae486cdff7a6b08385089

Chasan-Taber, L., Schmidt, M. D., Pekow, P., Sternfeld, B., Manson, J. E., Solomon, C. G., … Markenson, G. (2008). Physical activity and gestational diabetes mellitus among Hispanic women. *Journal of Women's Health (2002)*, *17*(6), 999–1008. http://doi.org/10.1089/jwh.2007.0560

Chasan-Taber, L., Schmidt, M. D., Pekow, P., Sternfeld, B., Manson, J., & Markenson, G. (2007). Correlates of physical activity in pregnancy among latina women. *Maternal and Child Health Journal*, *11*(4), 353–363. http://doi.org/10.1007/s10995-007-0201-8

Chasan-Taber, L., Schmidt, M. D., Roberts, D. E., Hosmer, D., Markenson, G., & Freedson, P. S. (2004). Development and validation of a Pregnancy Physical Activity Questionnaire. *Medicine and Science in Sports and Exercise*, *36*(10), 1750–1760.

Chasan-Taber, L., Silveira, M., Lynch, K. E., Pekow, P., Braun, B., Manson, J. E., … Markenson, G. (2014). Physical activity before and during pregnancy and risk of abnormal glucose tolerance among Hispanic women. *Diabetes & Metabolism*, *40*(1), 67–75. http://doi.org/http://dx.doi.org/10.1016/j.diabet.2013.09.005

Chatterjee, R., Shand, A., Nassar, N., Walls, M., & Khambalia, A. Z. (2016). Iron supplement use in pregnancy - Are the right women taking the right amount? *Clinical Nutrition*, *35*(3), 741–747. http://doi.org/10.1016/j.clnu.2015.05.014

Cheng, D., Schwarz, E. B., Douglas, E., & Horon, I. (2009). Unintended pregnancy and associated maternal preconception, prenatal and postpartum behaviors. *Contraception*, *79*(3), 194–198. http://doi.org/10.1016/j.contraception.2008.09.009

Cheung, N. W., Wasmer, G., & Al-Ali, J. (2001, May). Risk factors for gestational diabetes among Asian women. *Diabetes Care*. Letter, United States, United States.

Chiavaroli, V., Marcovecchio, M. L., De Giorgis, T., Diesse, L., Chiarelli, F., & Mohn, A. (2014). Progression of cardio-metabolic risk factors in subjects born small and large for gestational age. *PLoS ONE*, *9*(8). http://doi.org/10.1371/journal.pone.0104278

Chitme, H. R., Al Shibli, S. A. S., & Al-Shamiry, R. M. (2016). Risk Factors and Plasma Glucose Profile of Gestational Diabetes in Omani Women. *Oman Medical Journal*, *31*(5), 370–377. Journal Article. http://doi.org/10.5001/omj.2016.73

Chu, S. Y., Abe, K., Hall, L. R., Kim, S. Y., Njoroge, T., & Qin, C. (2009). Gestational diabetes mellitus: All Asians are not alike. *Preventive Medicine*, *49*(2–3), 265–268. http://doi.org/10.1016/j.ypmed.2009.07.001

Chu, S. Y., Callaghan, W. M., Kim, S. Y., Schmid, C. H., Lau, J., England, L. J., & Dietz, P. M. (2007). Maternal obesity and risk of gestational diabetes mellitus. *Diabetes Care*, *30*(8), 2070–2076. http://doi.org/10.2337/dc06-2559a

Clapp, J. F. (2002). Maternal carbohydrate intake and pregnancy outcome. *The Proceedings of the Nutrition Society*, *61*(1), 45–50. Retrieved from http://view.ncbi.nlm.nih.gov/pubmed/12008645

Clarke, S. D. (2004). The multi-dimensional regulation of gene expression by fatty acids: polyunsaturated fats as nutrient sensors. *Current Opinion in Lipidology*, *15*(1), 13–18. http://doi.org/10.1097/01.mol.0000113205.97033.22

Cohen, T. R., Plourde, H., & Koski, K. G. (2013). Use of the Pregnancy Physical Activity Questionnaire (PPAQ) to identify behaviours associated with appropriate gestational weight gain during pregnancy. *Journal of Physical Activity & Health*, *10*(7), 1000–7. http://doi.org/10.1123/jpah.10.7.1000

Colberg, S. R., Sigal, R. J., Fernhall, B., Regensteiner, J. G., Blissmer, B. J., Rubin, R. R., … Braun, B. (2010). Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*, *33*(12), e147-67. http://doi.org/10.2337/dc10-9990

Collier, A., Abraham, E. C., Armstrong, J., Godwin, J., Monteath, K., & Lindsay, R. (2016). Reported prevalence of gestational diabetes in Scotland: The relationship with obesity, age, socioeconomic status, smoking and macrosomia, and how many are we missing? *Journal of Diabetes Investigation*. http://doi.org/10.1111/jdi.12552

Conway, D. L. (2002). Delivery of the macrosomic infant: cesarean section versus vaginal delivery. *Seminars in Perinatology*, *26*(3), 225–231. http://doi.org/10.1053/sper.2002.33975

Cormier, H., Vigneault, J., Garneau, V., Tchernof, A., Vohl, M. C., Weisnagel, S. J., & Robitaille, J. (2015). An explained variance-based genetic risk score associated with gestational diabetes antecedent and with progression to pre-diabetes and type 2 diabetes: A cohort study. *BJOG: An International Journal of Obstetrics and Gynaecology*, *122*(3), 411–419. http://doi.org/10.1111/1471-0528.12937

Cosson, E., Cussac-Pillegand, C., Benbara, A., Pharisien, I., Jaber, Y., Banu, I., … Carbillon, L. (2014). The diagnostic and prognostic performance of a selective screening strategy for gestational diabetes mellitus according to ethnicity in Europe. *Journal of Clinical Endocrinology and Metabolism*, *99*(3), 996–1005. http://doi.org/10.1210/jc.2013-3383

Coustan, D. R. (2012). Point: The American Diabetes Association and the International Association of Diabetes and Pregnancy Study Groups Recommendations for Diagnosing Gestational Diabetes Should Be Used Worldwide. *Clinical Chemistry*, *58*(7), 1094–1097. http://doi.org/10.1373/clinchem.2012.186239

Crowther, C. A., Hiller, J. E., Moss, J. R., McPhee, A. J., Jeffries, W. S., & Robinson, J. S. (2005). Effect of Treatment of Gestational Diabetes Mellitus on Pregnancy Outcomes. *New England Journal of Medicine*, *352*(24), 2477–2486. http://doi.org/10.1056/NEJMoa042973

D'Angelo, D., Williams, L., Morrow, B., Cox, S., Harris, N., Harrison, L., … Zapata, L. (2007). Preconception and interconception health status of women who recently gave birth to a live-born infant--Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *MMWR. Surveillance Summaries : Morbidity and Mortality Weekly Report. Surveillance Summaries / CDC*. http://doi.org/10.2307/42568296

Dabelea, D., Snell-Bergeon, J. K., Hartsfield, C. L., Bischoff, K. J., Hamman, R. F., & McDuffie, R. S. (2005). Increasing prevalence of gestational diabetes mellitus (GDM) over time and by birth cohort: Kaiser Permanente of Colorado GDM screening program. *Diabetes Care*, *28*(3), 579–584. http://doi.org/10.2337/diacare.28.3.579

Dai, Z. Y., Liu, D., Li, R., Wang, Y., Zhang, J., Liu, J., … Zeng, G. (2016). Association between gestational weight gain per trimester/total gestational weight gain and gestational diabetes mellitus. *Zhonghua liu xing bing xue za zhi = Zhonghua liuxingbingxue zazhi*, *37*(10), 1336–1340.

De-Seymour, J., Chia, A., Colega, M., Jones, B., McKenzie, E., Shirong, C., … Chong, M. F. F. (2016). Maternal Dietary Patterns and Gestational Diabetes Mellitus in a Multi-Ethnic Asian Cohort: The GUSTO Study. *Nutrients*, *8*(9). http://doi.org/10.3390/nu8090574

de Vegt, F., Dekker, J. M., Groeneveld, W. J., Nijpels, G., Stehouwer, C. D., Bouter, L. M., & Heine, R. J. (2002). Moderate alcohol consumption is associated with lower risk for incident diabetes and mortality: the Hoorn Study. *Diabetes Res Clin Pract*, *57*(1), 53–60. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12007730

Deierlein, A. L., Siega-Riz, A. M., & Evenson, K. R. (2012). Physical Activity During Pregnancy and Risk of Hyperglycemia. *Journal of Women's Health*, *21*(7), 769–775. http://doi.org/10.1089/jwh.2011.3361

Di Cianni, G., Volpe, L., Lencioni, C., Miccoli, R., Cuccuru, I., Ghio, A., … Benzi, L. (2003). Prevalence and risk factors for gestational diabetes assessed by universal screening. *Diabetes Research and Clinical Practice*, *62*(2), 131–137. http://doi.org/10.1016/j.diabres.2003.07.004

Diouf, I., Charles, M. A., Blondel, B., Heude, B., & Kaminski, M. (2011). Discordant time trends in maternal body size and offspring birthweight of term deliveries in France between 1972 and 2003: Data from the French National Perinatal Surveys. *Paediatric and Perinatal Epidemiology*, *25*(3), 210–217. http://doi.org/10.1111/j.1365-3016.2010.01188.x

Dode, M. A. S. O., & dos Santos, I. S. (2009). Non classical risk factors for gestational diabetes mellitus: A systematic review of the literature . *Cadernos de Saude Publica*, *25*(SUPPL. 3), S341–S359. Retrieved from http://www.scopus.com/inward/record.url?eid=2-s2.0-72749110285&partnerID=40&md5=ab3ca6f8f28f493ccc6085decc796d19

Dölle, R., Schaffrath Rosario, a., & Stolzenberg, H. (2007). The German Health Interview and Examination Survey for Children and Adolescents (KiGGS): Data management. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, *50*(5–6), 567–572. http://doi.org/10.1007/s00103-007-0217-7

Donahue, S. M. A., Kleinman, K. P., Gillman, M. W., & Oken, E. (2010). Trends in birth weight and gestational length among singleton term births in the United States: 1990-2005. *Obstetrics and Gynecology*, *115*(2 Pt 1), 357–64. http://doi.org/10.1097/AOG.0b013e3181cbd5f5

Douglas Wilson, R., Audibert, F., Brock, J. A., Carroll, J., Cartier, L., Gagnon, A., … Van den Hof, M. (2015). Pre-conception Folic Acid and Multivitamin Supplementation for the Primary and Secondary Prevention of Neural Tube Defects and Other Folic Acid-Sensitive Congenital Anomalies. *Journal of Obstetrics and Gynaecology Canada*, *37*(6), 534–549. http://doi.org/10.1016/S1701-2163(15)30230-9

Durie, D. E., Thornburg, L. L., & Glantz, J. C. (2011). Effect of second-trimester and third-trimester rate of gestational weight gain on maternal and neonatal outcomes. *Obstetrics and Gynecology*, *118*(3), 569–575. http://doi.org/10.1097/AOG.0b013e3182289f42

Durnwald, C. P., Mele, L., Spong, C. Y., Ramin, S. M., Varner, M. W., Rouse, D. J., … Anderson, G. D. (2011). Glycemic characteristics and neonatal outcomes of women treated for mild gestational diabetes. *Obstetrics and Gynecology*, *117*(4), 819–27. http://doi.org/10.1097/AOG.0b013e31820fc6cf

Egeland, G. M., Skjaerven, R., & Irgens, L. M. (2000). Birth characteristics of women who develop gestational diabetes: population based study. *BMJ (Clinical Research Ed.)*, *321*(7260), 546–547. Journal Article, Research Support, Non-U.S. Gov't.

El-Hazmi, M. A., & Warsy, A. S. (2000). Prevalence of overweight and obesity in diabetic and non-diabetic Saudis. *Eastern Mediterranean Health Journal = La Revue de Sante de La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, *6*(2–3), 276–282.

England, L. J., Levine, R. J., Qian, C., Soule, L. M., Schisterman, E. F., Yu, K. F., & Catalano, P. M. (2004). Glucose Tolerance and Risk of Gestational Diabetes Mellitus in Nulliparous Women Who Smoke during Pregnancy. *American Journal of Epidemiology*, *160*(12), 1205–1213. http://doi.org/10.1093/aje/kwh340

England, L., Kotelchuck, M., Wilson, H. G., Diop, H., Oppedisano, P., Kim, S. Y., … Shapiro-Mendoza, C. K. (2015). Estimating the Recurrence Rate of Gestational Diabetes Mellitus (GDM) in Massachusetts 1998–2007: Methods and Findings. *Maternal and Child Health Journal*, *19*(10), 2303–2313. http://doi.org/10.1007/s10995-015-1750-x

Erem, C., Kuzu, U. B., Deger, O., & Can, G. (2015). Prevalence of gestational diabetes mellitus and associated risk factors in Turkish women: the Trabzon GDM Study. *Archives of Medical Science : AMS*, *11*(4), 724–35. http://doi.org/10.5114/aoms.2015.53291

Evenson, K. R., Chasan-Taber, L., Symons Downs, D., & Pearce, E. E. (2012). Review of self-reported physical activity assessments for pregnancy: Summary of the evidence for validity and reliability. *Paediatric and Perinatal Epidemiology*. http://doi.org/10.1111/j.1365-3016.2012.01311.x

Ewenighi C O, U, N. H., Uche, D., C, O. J., N, N. I., Onoh M, L. U., … Babatunde, A. (2013). Prevalence Of Gestational Diabetes Mellitus; Risk Factors Among Pregnant Women(In Abakaliki Metropolis, Ebonyi State Nigeria.). *National Journal of Integrated Research in Medicine*, *4*(1), 56–61. JOUR. Retrieved from http://www.scopemed.org/?mno=34372

Exavery, A., Kanté, A. M., Njozi, M., Tani, K., Doctor, H. V, Hingora, A., & Phillips, J. F. (2014). Predictors of mistimed, and unwanted pregnancies among women of childbearing age in Rufiji, Kilombero, and Ulanga districts of Tanzania. *Reproductive Health*, *11*, 63. http://doi.org/10.1186/1742-4755-11-63

Eze, I. C., Schaffner, E., Zemp, E., von Eckardstein, A., Turk, A., Bettschart, R., … Probst-Hensch, N. (2014). Environmental tobacco smoke exposure and diabetes in adult never-smokers. *Environmental Health : A Global Access Science Source*, *13*, 74. http://doi.org/10.1186/1476-069X-13-74

Fadl, H. E., Ostlund, I. K. M., Magnuson, A. F. K., & Hanson, U. S. B. (2010). Maternal and neonatal outcomes and time trends of gestational diabetes mellitus in Sweden from 1991 to 2003. *Diabetic Medicine : A Journal of the British Diabetic Association*, *27*(4), 436–441. http://doi.org/10.1111/j.1464-5491.2010.02978.x

FAO. (2014). FAO Statistics. Retrieved from http://faostat3.fao.org/home/E%5Cnhttp://faostat3.fao.org/faostat-gateway/go/to/download/Q/QC/E%5Cnhttp://faostat3.fao.org/

Farah, N., McGoldrick, A., Fattah, C., O'Connor, N., Kennelly, M. M., & Turner, M. J. (2012). Body Mass Index (BMI) and glucose intolerance during pregnancy in white European women. *Journal of Reproduction and Infertility*, *13*(2), 95–99.

Favilli, A., Pericoli, S., Acanfora, M. M., Bini, V., Di Renzo, G. C., & Gerli, S. (2012). Pregnancy outcome in women aged 40 years or more. *The Journal of Maternal-Fetal & Neonatal Medicine : The Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*, *25*(8), 1260–3. http://doi.org/10.3109/14767058.2011.643327

First Data Bank. (2005). Nutritionist Pro. *San Bruno, CA 94066.*

Freinkel, N. (1985). Summary and recommendations of the Second International Workshop-Conference on Gestational Diabetes Mellitus. *Diabetes*.

Fu, S., Li, F., Zhou, J., & Liu, Z. (2016). The Relationship Between Body Iron Status, Iron Intake And Gestational Diabetes: A Systematic Review and Meta-Analysis. *Medicine*, *95*(2), e2383. http://doi.org/10.1097/MD.0000000000002383

Fukatsu, M., Takai, Y., Matsunaga, S., Era, S., Ono, Y., Saito, M., … Seki, H. (2016). Diagnosis and potential management of gestational diabetes mellitus using the International association of diabetes and pregnancy study groups criteria. *The Journal of Obstetrics and Gynaecology Research*. http://doi.org/10.1111/jog.13223

Fung, T. T., Hu, F. B., Yu, J., Chu, N. F., Spiegelman, D., Tofler, G. H., … Rimm, E. B. (2000). Leisure-time physical activity, television watching, and plasma biomarkers of obesity and cardiovascular disease risk. *American Journal of Epidemiology*, *152*(12), 1171–1178. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11130623

Gaston, A., & Cramp, A. (2011). Exercise during pregnancy: A review of patterns and determinants. *Journal of Science and Medicine in Sport*. http://doi.org/10.1016/j.jsams.2011.02.006

Getahun, D., Fassett, M. J., & Jacobsen, S. J. (2010). Gestational diabetes: risk of recurrence in subsequent pregnancies. *Am J Obstet Gynecol*, *203*(5), 467.e1-6. http://doi.org/10.1016/j.ajog.2010.05.032

Gibson, K. S., Waters, T. P., & Catalano, P. M. (2012). Maternal weight gain in women who develop gestational diabetes mellitus. *Obstetrics and Gynecology*, *119*(3), 560–5. http://doi.org/10.1097/AOG.0b013e31824758e0

Gilmartin, A. "Bird" H., Ural, S. H., & Repke, J. T. (2008). Gestational Diabetes Mellitus. *Reviews in Obstetrics and Gynecology*, *1*(3), 129–134. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2582643/

Goletzke, J., Buyken, A. E., Louie, J. C. Y., Moses, R. G., & Brand-Miller, J. C. (2015). Dietary micronutrient intake during pregnancy is a function of carbohydrate quality1,2. *American Journal of Clinical Nutrition*, *102*(3), 626–632. http://doi.org/10.3945/ajcn.114.104836

Gollenberg, A. L., Pekow, P., Bertone-Johnson, E. R., Freedson, P. S., Markenson, G., & Chasan-Taber, L. (2010). Sedentary behaviors and abnormal glucose tolerance among pregnant latina women. *Medicine and Science in Sports and Exercise*, *42*(6), 1079–1085. http://doi.org/10.1249/MSS.0b013e3181c6dec8

González-Clemente, J. M., Carro, O., Gallach, I., Vioque, J., Humanes, a, Sauret, C., … Mauricio, D. (2007). Increased cholesterol intake in women with gestational diabetes mellitus. *Diabetes & Metabolism*, *33*(1), 25–9. http://doi.org/10.1016/j.diabet.2006.07.002

Gradmark, A., Pomeroy, J., Renström, F., Steiginga, S., Persson, M., Wright, A., … Franks, P. W. (2011). Physical activity, sedentary behaviors, and estimated insulin sensitivity and secretion in pregnant and non-pregnant women. *BMC Pregnancy and Childbirth*, *11*, 44. http://doi.org/10.1186/1471-2393-11-44

Green-Raleigh, K., Lawrence, J. M., Chen, H., Devine, O., & Prue, C. (2005). Pregnancy planning status and health behaviors among nonpregnant women in a California managed health care organization. *Perspectives on Sexual and Reproductive Health*, *37*(4), 179–183. http://doi.org/10.1363/psrh.37.179.05

Greenberg, J. A., Bell, S. J., Guan, Y., & Yu, Y.-H. (2011). Folic Acid supplementation and pregnancy: more than just neural tube defect prevention. *Reviews in Obstetrics & Gynecology*, *4*(2), 52–9. http://doi.org/10.3909/riog0157

Gross, L. S., Li, L., Ford, E. S., & Liu, S. (2004). Increased consumption of refined carbohydrates and the epidemic of type 2 diabetes in the United States: An ecologic assessment. *American Journal of Clinical Nutrition*, *79*(5), 774–779. http://doi.org/10.1016/j.jnutbio.2013.12.005

Group, N. D. D., National Diabetes Data Group, National Diabetes Data, G., & National Diabetes Data Group. (1979). Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. *Diabetes*, *28*(12), 1039–1057. http://doi.org/10.2337/diab.28.12.1039

Guelinckx, I., Devlieger, R., Beckers, K., & Vansant, G. (2008). Maternal obesity: Pregnancy complications, gestational weight gain and nutrition. *Obesity Reviews*. http://doi.org/10.1111/j.1467-789X.2007.00464.x

Gunderson, E. P., Abrams, B., & Selvin, S. (2001). Does the pattern of postpartum weight change differ according to pregravid body size? *International Journal of Obesity and Related Metabolic Disorders : Journal of the International Association for the Study of Obesity*, *25*(6), 853–862. http://doi.org/10.1038/sj.ijo.0801631

Guzman, J. R., Lyra, R., Aguilar-Salinas, C. a, Cavalcanti, S., Escano, F., Tambasia, M., … ALAD Consensus Group. (2008). Treatment of type 2 diabetes in Latin America: a consensus statement by the medical associations of 17 Latin American countries. *Revista Panamericana de Salud Publica*, *28*(6), 463–71. http://doi.org/10.1590/S1020-49892010001200008

Hadfield, R. M., Lain, S. J., Simpson, J. M., Ford, J. B., Raynes-Greenow, C. H., Morris, J. M., & Roberts, C. L. (2009). Are babies getting bigger? An analysis of birthweight trends in New South Wales, 1990-2005. *Medical Journal of Australia*, *190*(6), 312–315. http://doi.org/had10958_fm [pii]

Hall, L. M. L., Sattar, N., & Gill, J. M. R. (2008). Risk of metabolic and vascular disease in South Asians: potential mechanisms for increased insulin resistance. *Future Lipidology*, *3*, 411–424. http://doi.org/10.2217/17460875.3.4.411

Han, S., Middleton, P., & Crowther, C. a. (2012). Exercise for pregnant women for preventing gestational diabetes mellitus. *The Cochrane Database of Systematic Reviews*, *7*(7), CD009021. http://doi.org/10.1002/14651858.CD009021.pub2

Hanson, L., VandeVusse, L., Roberts, J., & Forristal, A. (2009). A Critical Appraisal of Guidelines for Antenatal Care: Components of Care and Priorities in Prenatal Education. *Journal of Midwifery and Women's Health*, *54*(6), 458–468. http://doi.org/10.1016/j.jmwh.2009.08.002

Hartini, T. N. S., Winkvist, A., Lindholm, L., Stenlund, H., Persson, V., Nurdiati, D. S., & Surjono, A. (2003). Nutrient intake and iron status of urban poor and rural poor without access to rice fields are affected by the emerging economic crisis: the case of pregnant Indonesian women. *European Journal of Clinical Nutrition*, *57*(5), 654–666. Retrieved from http://dx.doi.org/10.1038/sj.ejcn.1601595

Haugen, M., Brantsaeter, A. L., Alexander, J., & Meltzer, H. M. (2008). Dietary supplements contribute substantially to the total nutrient intake in pregnant Norwegian women. *Annals of Nutrition & Metabolism*, *52*(4), 272–80. http://doi.org/10.1159/000146274

He, J.-R. R., Yuan, M.-Y. Y., Chen, N.-N. N., Lu, J.-H. H., Hu, C.-Y. Y., Mai, W.-B. B., … Qiu, X. (2015). Maternal dietary patterns and gestational diabetes mellitus: a large prospective cohort study in China. *British Journal of Nutrition*, *113*(8), 1292–1300. http://doi.org/10.1017/S0007114515000707

He, X. J., Qin, F. Y., Hu, C. L., Zhu, M., Tian, C. Q., & Li, L. (2014). Is gestational diabetes mellitus an independent risk factor for macrosomia: a meta-analysis? *Arch Gynecol Obstet*, *291*(4), 729–735. http://doi.org/10.1007/s00404-014-3545-5

Hedderson, M., Ehrlich, S., Sridhar, S., Darbinian, J., Moore, S., & Ferrara, A. (2012). Racial/ethnic disparities in the prevalence of gestational diabetes mellitus by BMI. *Diabetes Care*, *35*(7), 1492–1498. http://doi.org/10.2337/dc11-2267

Hedderson, M. M., Darbinian, J. A., & Ferrara, A. (2010). Disparities in the risk of gestational diabetes by race-ethnicity and country of birth. *Paediatric and Perinatal Epidemiology*, *24*(5), 441–448. http://doi.org/10.1111/j.1365-3016.2010.01140.x

Hedderson, M. M., Gunderson, E. P., & Ferrara, A. (2010). Gestational Weight Gain and Risk of Gestational Diabetes Mellitus. *Obstetrics and Gynecology*, *115*(3), 597–604. http://doi.org/10.1097/AOG.0b013e3181cfce4f

Heery, E., Kelleher, C. C., Wall, P. G., & McAuliffe, F. M. (2014). Prediction of gestational weight gain - a biopsychosocial model. *Public Health Nutrition*, 1–11. http://doi.org/10.1017/S1368980014001815

Hendriks, H. F. J. (2007). Moderate Alcohol Consumption and Insulin Sensitivity: Observations and Possible Mechanisms. *Annals of Epidemiology*, *17*(5 SUPPL.). http://doi.org/10.1016/j.annepidem.2007.01.009

Heo, J. M., Kim, T. H., Hahn, M. H., Cho, G. J., Hong, S. C., Oh, M. J., & Kim, H. J. (2015). Comparison of the effects of gestational weight gain on pregnancy outcomes between non-diabetic and diabetic women. *Obstet Gynecol Sci*, *58*(6), 461–467. http://doi.org/10.5468/ogs.2015.58.6.461

Herrera, E. (2000). Metabolic adaptations in pregnancy and their implications for the availability of substrates to the fetus. *European Journal of Clinical Nutrition*, *54 Suppl 1*, S47–S51. http://doi.org/10.1038/sj.ejcn.1600984

Herring, S. J., Oken, E., Rifas-Shiman, S. L., Rich-Edwards, J. W., Stuebe, A. M., Kleinman, K. P., & Gillman, M. W. (2009). Weight gain in pregnancy and risk of maternal hyperglycemia. *American Journal of Obstetrics and Gynecology*, *201*(1). http://doi.org/10.1016/j.ajog.2009.01.039

Heude, B., Thiébaugeorges, O., Goua, V., Forhan, A., Kaminski, M., Foliguet, B., … Charles, M. A. (2012a). Pre-pregnancy body mass index and weight gain during pregnancy: Relations with gestational diabetes and hypertension, and birth outcomes. *Maternal and Child Health Journal*, *16*(2), 355–363. http://doi.org/10.1007/s10995-011-0741-9

Heude, B., Thiébaugeorges, O., Goua, V., Forhan, a., Kaminski, M., Foliguet, B., … Charles, M. a. (2012b). Pre-pregnancy body mass index and weight gain during pregnancy: Relations with gestational diabetes and hypertension, and birth outcomes. *Maternal and Child Health Journal*, *16*, 355–363. http://doi.org/10.1007/s10995-011-0741-9

Heude, B., Thiébaugeorges, O., Goua, V., Forhan, a., Kaminski, M., Foliguet, B., … M.A., C. (2012). Pre-pregnancy body mass index and weight gain during pregnancy: Relations with gestational diabetes and hypertension, and birth outcomes. *Maternal and Child Health Journal*, *16*(2), 355–363. http://doi.org/10.1007/s10995-011-0741-9

Hillier, T. A., Vesco, K. K., Pedula, K. L., Beil, T. L., Whitlock, E. P., & Pettitt, D. J. (2008). Screening for gestational diabetes mellitus: A systematic review for the U.S. preventive services task force. *Annals of Internal Medicine*.

Hod, M., & Yogev, Y. (2007). Goals of Metabolic Management of Gestational Diabetes: Is it all about the sugar? . *Diabetes Care* , *30*(Supplement 2), S180–S187. http://doi.org/10.2337/dc07-s213

Hoet, J. P., & Lukens, F. D. (1954). Carbohydrate metabolism during pregnancy. *Diabetes*, *3*(1), 1–12.

Hofmann, S. M., Dong, H. J., Li, Z., Cai, W., Altomonte, J., Thung, S. N., … Vlassara, H. (2002). Improved insulin sensitivity is associated with restricted intake of dietary glycoxidation products in the db/db mouse. *Diabetes*, *51*(7), 2082–2089. http://doi.org/10.2337/diabetes.51.7.2082

Hu, F. B. (2011). Globalization of diabetes: The role of diet, lifestyle, and genes. In *Diabetes Care* (Vol. 34, pp. 1249–1257). http://doi.org/10.2337/dc11-0442

Hu, F. B., Leitzmann, M. F., Stampfer, M. J., Colditz, G. a, Willett, W. C., & Rimm, E. B. (2001). Physical activity and television watching in relation to risk for type 2 diabetes mellitus in men. *Archives of Internal Medicine*, *161*, 1542–1548. http://doi.org/ioi00636 [pii]

Hu, F. B., Rimm, E., Smith-Warner, S. A., Feskanich, D., Stampfer, M. J., Ascherio, A., … Willett, W. C. (1999). Reproducibility and validity of dietary patterns assessed with a food- frequency questionnaire. *American Journal of Clinical Nutrition*, *69*(2), 243–249.

Huang, T. T.-K., Roberts, S. B., Howarth, N. C., & McCrory, M. A. (2005). Effect of screening out implausible energy intake reports on relationships between diet and BMI. *Obesity Research*, *13*(7), 1205–1217. http://doi.org/10.1038/oby.2005.143

Hulley, S. B., Cummings, S. R., Browner, W. S., Grady, D. G., & Newman, T. B. (2013). *Designing Clinical Research*. Wolters Kluwer Health. Retrieved from https://books.google.com.my/books?id=_b62TBnoppYC

Hummel, S., Much, D., Rossbauer, M., Ziegler, A. G., & Beyerlein, A. (2013). Postpartum outcomes in women with gestational diabetes and their offspring: POGO study design and first-year results. *Review of Diabetic Studies*, *10*(1), 49–57. http://doi.org/10.1900/RDS.2013.10.49

Hung, T.-H., & Hsieh, T.-T. (2016). Pregestational body mass index, gestational weight gain, and risks for adverse pregnancy outcomes among Taiwanese women: A retrospective cohort study. *Taiwanese Journal of Obstetrics & Gynecology*, *55*(4), 575–81. http://doi.org/10.1016/j.tjog.2016.06.016

Hunsberger, M., Rosenberg, K. D., & Donatelle, R. J. (2010). Racial/ethnic disparities in gestational diabetes mellitus: Findings from a population-based survey. *Women's Health Issues*, *20*(5), 323–328. http://doi.org/10.1016/j.whi.2010.06.003

Hur, J., Kim, H., Ha, E.-H., Park, H., Ha, M., Kim, Y., … Chang, N. (2013). Birth weight of Korean infants is affected by the interaction of maternal iron intake and GSTM1 polymorphism. *The Journal of Nutrition*, *143*(1), 67–73. http://doi.org/10.3945/jn.112.161638

Hwang, J., Lee, J., Kim, K.-N., Kim, H., Ha, E.-H., Park, H., … Chang, N. (2013). Maternal iron intake at mid-pregnancy is associated with reduced fetal growth: results from Mothers and Children's Environmental Health (MOCEH) study. *Nutrition Journal*, *12*, 38. http://doi.org/10.1186/1475-2891-12-38

Idris, N., Hatikah, C. H. C., Murizah, M. Z., & Rushdan, M. N. (2009). Universal versus selective screening for detection of gestational diabetes mellitus in a Malaysian population. *Malaysian Family Physician: The Official Journal of the Academy of Family Physicians of Malaysia*, *4*(2–3), 83.

Inoue, S., Naruse, H., Yorifuji, T., Kato, T., Murakoshi, T., Doi, H., & Subramanian, S. V. (2016). Association between Short Maternal Height and Low Birth Weight: a Hospital-based Study in Japan. *Journal of Korean Medical Science*, *31*(3), 353–359. http://doi.org/10.3346/jkms.2016.31.3.353

International Association of Diabetes and Pregnancy Study Groups Consensus Panel, I. A. of D. and P. S. G. C., Metzger, B. B. E., Gabbe, S. G., Persson, B., Buchanan, T. A. T., Catalano, P. A., … Panel, I. A. of D. and P. S. G. C. (2010). International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. *Diabetes Care* , *33*(3), 676–682. http://doi.org/10.2337/dc09-1848

IOM. (1990). *Nutrition during pregnancy*. (Institute of Medicine (US), Ed.). Washington (DC): National Academy of Sciences.

IOM. (2009). *Weight Gain During Pregnancy: Reexamining the Guidelines*. (K. M. Rasmussen & A. L. Yaktine, Eds.). Washington (DC): The National Academies Press.

IOM, I. of M. (US), & Institute of Medicine. (2011). *Dietary reference intakes for calcium and vitamin D*. *IOM* (Vol. 130).

IPH. (1996). *The Second National Health and Morbidity Study (NHMS 2)*. Ministry of Health Malaysia. Kuala Lumpur.: Institute for Public Health. Ministry of Health, Malaysia.

IPH. (2006). *The Third National Health and Morbidity Survey (2011)*. Ministry of Health Malaysia. Kuala Lumpur.: Institute for Public Health. Ministry of Health, Malaysia.

IPH. (2015). *National Health and Morbidity Survey 2015 (NHMS 2015)*. Ministry of Health Malaysia. Kuala Lumpur.: Institute for Public Health. Ministry of Health, Malaysia.

Jalaly, P., Ghodsi, Z., & Hojjatoleslami, S. (2015). Health Behavior's Deference in Intended and Unintended Pregnancies. *Procedia - Social and Behavioral Sciences*, *185*, 156–159. http://doi.org/http://dx.doi.org/10.1016/j.sbspro.2015.03.420

Jang, H. C. (2011). Gestational diabetes in Korea: incidence and risk factors of diabetes in women with previous gestational diabetes. *Diabetes & Metabolism Journal*, *35*(1), 1–7. http://doi.org/10.4093/dmj.2011.35.1.1

Jang, H. C., Min, H. K., Lee, H. K., Cho, N. H., & Metzger, B. E. (1998). Short stature in Korean women: A contribution to the multifactorial predisposition to gestational diabetes mellitus. *Diabetologia*, *41*(7), 778–783. http://doi.org/10.1007/s001250050987

Jansson, T., Myatt, L., & Powell, T. L. (2009). The role of trophoblast nutrient and ion transporters in the development of pregnancy complications and adult disease. *Current Vascular Pharmacology*, *7*, 521–533. http://doi.org/10.2174/157016109789043982

Jasti, S., Siega-Riz, A. M., Cogswell, M. E., & Hartzema, A. G. (2005). Pill count adherence to prenatal multivitamin/mineral supplement use among low-income women. *Journal of Nutrition*. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed7&NEWS=N&AN=2005212315

Jeganathan, R., Karalasingam, S. D., Man, Z., Naidu, G. B., & Fadzi, M. B. (2011). *Preliminary Report of National Obstetrics Registry, July-December 2009*. (R. Jeganathan & S. D. Karalasingam, Eds.). . Kuala Lumpur, Malaysia: Jointly published by the National Obstetrics Registry and the Clinical Research Centre (CRC), Ministry of Health Malaysia.

Jiang, R., Manson, J. E., Meigs, J. B., Ma, J., Rifai, N., & Hu, F. B. (2004). Body iron stores in relation to risk of type 2 diabetes in apparently healthy women. *JAMA*, *291*(6), 711–7. http://doi.org/10.1001/jama.291.6.711

Jing, W., Huang, Y., Liu, X., Luo, B., Yang, Y., & Liao, S. (2015). The effect of a personalized intervention on weight gain and physical activity among pregnant women in China. *International Journal of Gynecology & Obstetrics*, *129*(2), 138–141. http://doi.org/10.1016/j.ijgo.2014.11.014

Kaess, B. M., Pedley, A., Massaro, J. M., Murabito, J., Hoffmann, U., & Fox, C. S. (2012). The ratio of visceral to subcutaneous fat, a metric of body fat distribution, is a unique correlate of cardiometabolic risk. *Diabetologia*, *55*(10), 2622–2630. http://doi.org/10.1007/s00125-012-2639-5

Kaiser, L., & Allen, L. H. (2008). Position of the American Dietetic Association: nutrition and lifestyle for a healthy pregnancy outcome. *Journal of the American Dietetic Association*, *108*(3), 553–561. http://doi.org/10.1016/j.jada.2008.01.030

Karamanos, B., Thanopoulou, A., Anastasiou, E., Assaad-Khalil, S., Albache, N., Bachaoui, M., … MGSD-GDM Study Group. (2014). Relation of the Mediterranean diet with the incidence of gestational diabetes. *European Journal of Clinical Nutrition*, *68*(1), 8–13. http://doi.org/10.1038/ejcn.2013.177

Keshavarz, M., Cheung, N. W., Babaee, G. R., Moghadam, H. K., Ajami, M. E., & Shariati, M. (2005). Gestational diabetes in Iran: Incidence, risk factors and pregnancy outcomes. *Diabetes Research and Clinical Practice*, *69*(3), 279–286. http://doi.org/10.1016/j.diabres.2005.01.011

Khajehpour, M., Simbar, M., Jannesari, S., Ramezani-Tehrani, F., & Majd, H. A. (2013). Health status of women with intended and unintended pregnancies. *Public Health*, *127*(1), 58–64. http://doi.org/10.1016/j.puhe.2012.08.011

Khalil, A., Syngelaki, A., Maiz, N., Zinevich, Y., Nicolaides, K. H., & Nicolaides, H. K. H. (2013). Maternal age and adverse pregnancy outcome: a cohort study. *Ultrasound Obstet Gynecol*, *42*, 634–643. http://doi.org/10.1002/uog.12494

Khosravi-Boroujeni, H., Sarrafzadegan, N., Mohammadifard, N., Alikhasi, H., Sajjadi, F., Asgari, S., & Esmaillzadeh, A. (2012). Consumption of sugar-sweetened beverages in relation to the metabolic syndrome among Iranian adults. *Obesity Facts*, *5*(4), 527–537. http://doi.org/10.1159/000341886

Kim, C., Berger, D. K., & Chamany, S. (1980). American Diabetes Association Workshop-Conference on gestational diabetes: summary and recommendations Recurrence of Gestational Diabetes Mellitus: A systematic review. *Diabetes Care*, *3*(3), 499–501. http://doi.org/10.2337/diacare.3.3.499 10.2337/dc06-2517

Kim, C., Berger, D. K., & Chamany, S. (2007). Recurrence of Gestational Diabetes Mellitus. *Diabetes Care*, *30*, 1314–1319. http://doi.org/10.2337/dc06-2517.Abbreviations

Kim, C., Newton, K. M., & Knopp, R. H. (2002). Gestational Diabetes and the Incidence of Type 2 Diabetes: A systematic review . *Diabetes Care* , *25*(10), 1862–1868. http://doi.org/10.2337/diacare.25.10.1862

Kim, S. S. Y., England, L., Sappenfield, W., Wilson, H. G. H., Bish, C. L. C., Salihu, H. H. M., & Sharma, A. A. J. (2012). Racial/ethnic differences in the percentage of gestational diabetes mellitus cases attributable to overweight and obesity, Florida, 2004-2007. *Preventing Chronic Disease*, *9*(6), E88. http://doi.org/10.5888/pcd9.110249

Kim, S. Y., England, L., Wilson, H. G., Bish, C., Satten, G. a., & Dietz, P. (2010). Percentage of gestational diabetes mellitus attributable to overweight and obesity. *American Journal of Public Health*, *100*(6), 1047–1052. http://doi.org/10.2105/AJPH.2009.172890

Kim, S. Y., Saraiva, C., Curtis, M., Wilson, H. G., Troyan, J., England, L., & Sharma, A. J. (2013). Fraction of gestational diabetes mellitus attributable to overweight and obesity by race/ethnicity, California, 2007-2009. *American Journal of Public Health*, *103*(10). http://doi.org/10.2105/AJPH.2013.301469

King, J. C. (2000). Physiology of pregnancy and nutrient metabolism. In *American Journal of Clinical Nutrition* (Vol. 71).

Koppes, L. L. J., Dekker, J. M., Hendriks, H. F. J., Bouter, L. M., & Heine, R. J. (2005). Moderate alcohol consumption lowers the risk of type 2 diabetes: A meta-analysis of prospective observational studies. *Diabetes Care*, *28*(3), 719–725. Retrieved from http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L40315340%5Cnhttp://dx.doi.org/10.2337/diacare.28.3.719

Kowal, C., Kuk, J., & Tamim, H. (2012). Characteristics of weight gain in pregnancy among canadian women. *Maternal and Child Health Journal*, *16*(3), 668–676. http://doi.org/10.1007/s10995-011-0771-3

Krishnaveni, G. V., Hill, J. C., Veena, S. R., Geetha, S., Jayakumar, M. N., Karat, C. L. S., & Fall, C. H. D. (2007). Gestational diabetes and the incidence of diabetes in the 5 years following the index pregnancy in South Indian women. *Diabetes Research and Clinical Practice*, *78*(3), 398–404. http://doi.org/10.1016/j.diabres.2007.06.002

Kumari, A. S., & Badrinath, P. (2002). Extreme grandmultiparity: Is it an obstetric risk factor? *European Journal of Obstetrics and Gynecology and Reproductive Biology*, *101*(1), 22–25. http://doi.org/10.1016/S0301-2115(01)00498-5

Kwapisz, J., & Bodaghi, M. (2013). *Preliminary Report of National Obstetrics Registry, Jan-December 2010*. (R. Jeganathan & S. D. Karalasingam, Eds.). Kuala Lumpur, Malaysia, Malaysia: Jointly published by the National Obstetrics Registry and the Clinical Research Centre (CRC), Ministry of Health Malaysia.

Lagiou, P., Tamimi, R. M., Mucci, L. A., Adami, H.-O., Hsieh, C.-C., & Trichopoulos, D. (2004). Diet during pregnancy in relation to maternal weight gain and birth size. *European Journal of Clinical Nutrition*, *58*(2), 231–237. http://doi.org/10.1038/sj.ejcn.1601771

Laitinen, J., Power, C., & Järvelin, M. R. (2001). Family social class, maternal body mass index, childhood body mass index, and age at menarche as predictors of adult obesity. *The American Journal of Clinical Nutrition*, *74*(3), 287–94. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11522550

Landon, M. B., Spong, C. Y., Thom, E., Carpenter, M. W., Ramin, S. M., Casey, B., … Anderson, G. B. (2009). A multicenter, randomized trial of treatment for mild gestational diabetes. *The New England Journal of Medicine*, *361*(14), 1339–48. http://doi.org/10.1056/NEJMoa0902430

Lao, T. T., Chan, B. C. P., Leung, W.-C., Ho, L.-F., & Tse, K.-Y. (2007). Maternal hepatitis B infection and gestational diabetes mellitus. *Journal of Hepatology*, *47*, 46–50. http://doi.org/10.1016/j.jhep.2007.02.014

Lao, T. T., Chan, L. Y., Tam, K. F., & Ho, L. F. (2002). Maternal hemoglobin and risk of gestational diabetes mellitus in Chinese women. *Obstetrics and Gynecology*, *99*(5), 807–812. http://doi.org/10.1016/S0029-7844(02)01941-5

Lao, T. T., Chan, P. L., & Tam, K. F. (2001). Gestational diabetes mellitus in the last trimester - A feature of maternal iron excess? *Diabetic Medicine*, *18*(3), 218–223. http://doi.org/10.1046/j.1464-5491.2001.00453.x

Lao, T. T., Ho, L.-F., Chan, B. C. P., & Leung, W.-C. (2006). Maternal Age and Prevalence of Gestational Diabetes Mellitus. *Diabetes Care*, *29*(4), 948 LP-949. JOUR. Retrieved from http://care.diabetesjournals.org/content/29/4/948.abstract

Lawrence, J. M., Contreras, R., Chen, W., & Sacks, D. A. (2008). Trends in the prevalence of preexisting diabetes and gestational diabetes mellitus among a racially/ethnically diverse population of pregnant women, 1999-2005. *Diabetes Care*, *31*(5), 899–904. http://doi.org/10.2337/dc07-2345

Leary, J., Pettitt, D. J., & Jovanovič, L. (2010). Gestational diabetes guidelines in a HAPO world. *Best Practice and Research: Clinical Endocrinology and Metabolism*. http://doi.org/10.1016/j.beem.2010.05.009

Lee, H., Jang, H. C., Park, H. K., Metzger, B. E., & Cho, N. H. (2008). Prevalence of type 2 diabetes among women with a previous history of gestational diabetes mellitus. *Diabetes Res Clin Pract*, *81*(1), 124–129. http://doi.org/S0168-8227(08)00141-1 [pii]\r10.1016/j.diabres.2008.02.017 [doi]

Leng, J., Liu, G., Zhang, C., Xin, S., Chen, F., Li, B., … Yang, X. (2016). Physical Activity, Sedentary Behaviors and Risk of Gestational Diabetes Mellitus: A Population-Based Cross-Sectional Study in Tianjin, China. *European Journal of Endocrinology / European Federation of Endocrine Societies*. http://doi.org/10.1530/EJE-15-1103

Leng, J., Shao, P., Zhang, C., Tian, H., Zhang, F., Zhang, S., … Yang, X. (2015). Prevalence of gestational diabetes mellitus and its risk factors in Chinese pregnant women: A prospective population-based study in Tianjin, China. *PLoS ONE*, *10*(3). http://doi.org/10.1371/journal.pone.0121029

Ley, S. H., Hanley, A. J., Retnakaran, R., Sermer, M., Zinman, B., & O'Connor, D. L. (2011). Effect of macronutrient intake during the second trimester on glucose metabolism later in pregnancy. *American Journal of Clinical Nutrition*, *94*(5), 1232–1240. http://doi.org/10.3945/ajcn.111.018861

Li, G., Kong, L., Li, Z., Zhang, L., Fan, L., Zou, L., … Zhang, W. (2014). Prevalence of macrosomia and its risk factors in China: A multicentre survey based on birth data involving 101 723 singleton term infants. *Paediatric and Perinatal Epidemiology*, *28*(4), 345–350. http://doi.org/10.1111/ppe.12133

Li, M., Halldorsson, T. I., Bjerregaard, A. A., Che, Y., Mao, Y., Hu, W., … Strøm, M. (2014). Relative validity and reproducibility of a food frequency questionnaire used in pregnant women from a rural area of China. *Acta Obstetricia et Gynecologica Scandinavica*, *93*(11), 1141–1149. http://doi.org/10.1111/aogs.12460

Li, N., Liu, E., Guo, J., Pan, L., Li, B., Wang, P., … Hu, G. (2013). Maternal prepregnancy body mass index and gestational weight gain on pregnancy outcomes. *PLoS ONE*, *8*(12), e82310. http://doi.org/10.1371/journal.pone.0082310

Li, W., Wang, Y., Shen, L., Song, L., Li, H., Liu, B., … Wang, Y. (2016). Association between parity and obesity patterns in a middle-aged and older Chinese population: a cross-sectional analysis in the Tongji-Dongfeng cohort study. *Nutrition {&} Metabolism*, *13*(1), 72. http://doi.org/10.1186/s12986-016-0133-7

Lim, H. M., Chee, H., Kandiah, M., Shamsuddin, K., Jamaluddin, J., Nordin, N., & Shuib, R. (2003). Dietary and other factors associated with overweight among women workers in two electronics factories in selangor. *Malaysian Journal of Nutrition*, *9*(2), 105–24. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/22691732

Lin, P.-C., Hung, C.-H., Chan, T.-F., Lin, K.-C., Hsu, Y.-Y., & Tzeng, Y.-L. (2016). The risk factors for gestational diabetes mellitus: A retrospective study. *Midwifery*, *42*, 16–20. JOURNAL ARTICLE. http://doi.org/10.1016/j.midw.2016.09.008

Lindqvist, M., Lindkvist, M., Eurenius, E., Persson, M., Ivarsson, A., & Mogren, I. (2016). Leisure time physical activity among pregnant women and its associations with maternal characteristics and pregnancy outcomes. *Sexual & Reproductive Healthcare*, 1–7. http://doi.org/10.1016/j.srhc.2016.03.006

Liu, A., Zhang, R., Li, Z., Qu, P., Zhao, Y., & Yan, H. (2015). Incidence of low birth weight among single live birth neonates and influencing factors in Shaanxi. *Zhonghua Liu Xing Bing Xue Za Zhi = Zhonghua Liuxingbingxue Zazhi*, *36*(11), 1244–1248.

Logan, C., Holcombe, E., Manlove, J., & Ryan, S. (2007). *The consequences of unintended childbearing*. *Washington, DC: Child Trends and National Campaign to Prevent Teen Pregnancy* (Vol. 28). Retrieved from https://scholar.google.com/scholar?q=Cassandra,+et+al.+(2007).+The+Consequences+of+Unintended+Childbearing&btnG=&hl=en&as_sdt=0%252

Lowe, L. P., Metzger, B. E., Dyer, A. R., Lowe, J., McCance, D. R., Lappin, T. R. J., … Group, for the H. S. C. R. (2012). Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study: Associations of maternal A1C and glucose with pregnancy outcomes. *Diabetes Care*, *35*(3), 574–580. http://doi.org/10.2337/dc11-1687

Loy, S.-L., & Jan Mohamed, H. J. B. (2013). Relative validity of dietary patterns during pregnancy assessed with a food frequency questionnaire. *International Journal of Food Sciences and Nutrition*, *7486*(6), 1–6. http://doi.org/10.3109/09637486.2013.787398

Loy, S. L., Marhazlina, M., & Jan, J. M. H. (2013). Association between maternal food group intake and birth size. *Sains Malaysiana*, *42*(11), 1633–1640.

Loy, S. L., Marhazlina, M., Nor Azwany, Y., & Hamid Jan, J. M. (2011). Development, validity and reproducibility of a food frequency questionnaire in pregnancy for the Universiti Sains Malaysia birth cohort study. *Malaysian Journal of Nutrition*, *17*(1), 1–18.

Loy, S. L., Marhazlina, M., Nor Azwany, Y., & Hamid Jan, J. M. (2011). Higher intake of fruits and vegetables in pregnancy is associated with birth size. *Southeast Asian Journal of Tropical Medicine and Public Health*, *42*(5), 1214–1223.

Lu, Y., Zhang, J., Lu, X., Xi, W., & Li, Z. (2011). Secular trends of macrosomia in southeast China, 1994-2005. *BMC Public Health*, *11*(1), 818. http://doi.org/10.1186/1471-2458-11-818

Lumbanraja, S., Lutan, D., & Usman, I. (2013). Maternal weight gain and correlation with birth weight infants. *Procedia - Social and Behavioral Sciences*, *103*, 647–656. http://doi.org/10.1016/j.sbspro.2013.10.383

MacNeill, S., Dodds, L., Hamilton, D. C., Armson, B. A., & VandenHof, M. (2001). Rates and risk factors for recurrence of gestational diabetes. *Diabetes Care*, *24*(4), 659–662. http://doi.org/10.2337/diacare.24.4.659

Malaysian Adult Nutrition Survey. (2003). *Food Portion Sizes of Malaysian Foods Album 2002/2003*. Ministry of Health Malaysia, Putrajaya.

Malik, V. S., Popkin, B. M., & Bray, G. a. (2010). Sugar-Sweetened beverages and risk of metabolic syndrome and Type 2 Diabetes. *Diabetes Care*, *33*(11), 2477–81. http://doi.org/10.2337/dc10-1079.

Martin, K. E., Grivell, R. M., Yelland, L. N., & Dodd, J. M. (2015). The influence of maternal BMI and gestational diabetes on pregnancy outcome. *Diabetes Research and Clinical Practice*, *108*(3), 508–513. http://doi.org/10.1016/j.diabres.2014.12.015

McCarthy, E. a, Strauss, B. J. G., Walker, S. P., & Permezel, M. (2004). Determination of maternal body composition in pregnancy and its relevance to perinatal outcomes. *Obstetrical & Gynecological Survey*, *59*(10), 731-742-746. http://doi.org/10.1097/01.ogx.0000140039.10861.91

Metzger, B. E. (1991). ADA Workshop-Conference Organizing Committee: Summary and recommendations of the Third International Workshop-Conference on Gestational Diabetes Mellitus. *Diabetes*, *40*(Suppl. 2), 197–201. http://doi.org/10.2337/diab.40.2.S197

Metzger, B. E., Buchanan, T. A., Coustan, D. R., De Leiva, A., Dunger, D. B., Hadden, D. R., … Zoupas, C. (2007). Summary and Recommendations of the Fifth International Workshop-Conference on Gestational Diabetes Mellitus. *Diabetes Care*, *30*(S2), S251–S260.

Metzger, B. E., Lowe, L. P., Dyer, A. R., Trimble, E. R., Chaovarindr, U., Coustan, D. R., … Group, H. S. C. R. (2008). Hyperglycemia and adverse pregnancy outcomes. The HAPO Study cooperative research group. *N Engl J Med*, *358*, 1991–2002.

Metzger, B. E., Lowe, L. P., Dyer, A. R., Trimble, E. R., Chaovarindr, U., Coustan, D. R., … Sacks, D. A. (2008). Hyperglycemia and adverse pregnancy outcomes. *The New England Journal of Medicine*, *358*(19), 1991–2002. http://doi.org/10.1056/NEJMoa0707943

Metzger, B. E., Lowe, L. P., Dyer, A. R., Trimble, E. R., Sheridan, B., Hod, M., … Oats, J. J. N. (2009). Hyperglycemia and adverse pregnancy outcome (HAPO) study: Associations with neonatal anthropometrics. *Diabetes*, *58*(2), 453–459. http://doi.org/10.2337/db08-1112

Miller, H. C. (1945). The effect of the prediabetic state on the survival of the fetus and the birth weight of the newborn infant. *N Engl J Med*, *233*(13), 376–378. http://doi.org/10.1056/NEJM194509272331302

Ministry of Health Malaysia. (2007). *The Malaysian Adults Nutrition Survey (MANS)-Findings Report 2003*. Nutrition Section Family Health Development Division, Putrajaya: Ministry of Health Malaysia, Malaysia.

Ministry of Health Malaysia. (2013). *Perinatal Care Manual 3rd Edition*. Putrajaya, Malaysia: Division of Family Health Development, MOH.

Ministry of Health Malaysia. (2015). *Clinical Practice Guidelines (CPG) on Management of Type 2 Diabetes Mellitus*. *Malaysian Endocrine & Metabolic Society and Diabetes Malaysia* (5th editio, Vol. 5th editio). Kuala Lumpur, Malaysia: Joint Publication of the Ministry of Health Malaysia, Academy of Medicine Malaysia. http://doi.org/10.1007/s13398-014-0173-7.2

Morikawa, M., Yamada, T., Yamada, T., Sato, S., Cho, K., & Minakami, H. (2012). Prevalence of hyperglycemia during pregnancy according to maternal age and pre-pregnancy body mass index in Japan, 2007-2009. *International Journal of Gynecology and Obstetrics*, *118*(3), 198–201. http://doi.org/10.1016/j.ijgo.2012.04.019

Morisset, A.-S., Tchernof, A., Dubé, M.-C., Veillette, J., Weisnagel, S. J., & Robitaille, J. (2011). Weight gain measures in women with gestational diabetes mellitus. *Journal of Women's Health (2002)*, *20*(3), 375–380. http://doi.org/10.1089/jwh.2010.2252

Moses, R. G., Casey, S. A., Quinn, E. G., Cleary, J. M., Tapsell, L. C., Milosavljevic, M., … Brand-Miller, J. C. (2014). Pregnancy and Glycemic Index Outcomes study: Effects of low glycemic index compared with conventional dietary advice on selected pregnancy outcomes. *American Journal of Clinical Nutrition*, *99*(3), 517–523. http://doi.org/10.3945/ajcn.113.074138

Mosher, W. D., Jones, J., & Abma, J. C. (2012). Intended and unintended births in the United States: 1982-2010. *National Health Statistics Reports*, (55), 1–28. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/23115878

Motl, R. W., McAuley, E., & DiStefano, C. (2005). Is social desirability associated with self-reported physical activity? *Preventive Medicine*, *40*(6), 735–739. http://doi.org/10.1016/j.ypmed.2004.09.016

Mukerji, G., Chiu, M., & Shah, B. R. (2013). Gestational diabetes mellitus and pregnancy outcomes among Chinese and South Asian women in Canada. *Journal of Maternal-Fetal and Neonatal Medicine*, *26*(3), 279–284. Retrieved from http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L368113992%5Cnhttp://dx.doi.org/10.3109/14767058.2012.735996

Nam, K.-C., Jo, C., & Lee, M. (2010). Meat products and consumption culture in the East. *Meat Science*, *86*(1), 95–102. http://doi.org/http://dx.doi.org/10.1016/j.meatsci.2010.04.026

Nascimento, S. L., Surita, F. G., & Cecatti, J. G. (2012). Physical exercise during pregnancy. *Current Opinion in Obstetrics and Gynecology*, *24*(6), 387–394. http://doi.org/10.1097/GCO.0b013e328359f131

National Coordinating Committee on Food and Nutrition. (2005). *Recommended Nutrient Intakes for Malaysia. A Report of the Technical Working Group on Nutritional Guidelines.* Ministry of Health Malaysia, Putrajaya.

National Coordinating Committee on Food and Nutrition. (2010). *Malaysian Dietary Guidelines 2010. A Report of the Technical Working Group on Nutritional Guidelines.* (Vol. 1). Ministry of Health Malaysia, Putrajaya. Retrieved from http://www.moh.gov.my/images/gallery/Garispanduan/diet/introduction.pdf

Negrato, C., & Gomes, M. (2013). Historical facts of screening and diagnosing diabetes in pregnancy. *Diabetology & Metabolic Syndrome*, *5*(1), 22. http://doi.org/10.1186/1758-5996-5-22

Nehring, I., Schmoll, S., Beyerlein, A., Hauner, H., & Von Kries, R. (2011). Gestational weight gain and long-term postpartum weight retention: A meta-analysis. *American Journal of Clinical Nutrition*, *94*(5), 1225–1231. http://doi.org/10.3945/ajcn.111.015289

NICE. (2015). Diabetes in pregnancy: management of diabetes and its complications from preconception to the postnatal period. *NICE Guidelines NG3*, (February), 2007–2009. Retrieved from http://www.nice.org.uk/guidance/ng3/chapter/1-recommendations

Nicklas, T. A., Webber, L. S., Thompson, B., & Berenson, G. S. (1989). A multivariate model for assessing eating patterns and their relationship to cardiovascular risk factors: the Bogalusa Heart Study. *The American Journal of Clinical Nutrition*, *49*(6), 1320–1327.

Nohira, T. T., Kim, S., Nakai, H., Okabe, K., Nohira, T. T., & Yoneyama, K. (2006). Recurrence of gestational diabetes mellitus: Rates and risk factors from initial GDM and one abnormal GTT value. *Diabetes Research and Clinical Practice*, *71*(1), 75–81. http://doi.org/10.1016/j.diabres.2005.05.011

Noor, M. I. (2002). The nutrition and health transition in Malaysia. *Public Health Nutrition*, *5*(1A), 191–195. http://doi.org/10.1079/PHN2001293

Nor Azian, M. Z., Hiong, T. G., Mohd Naim, R., Hasimah, I., Maria, S Awaluddin, Noor Safiza Mohamad Nor, R. S., & Zainuddin, A. A. (2015). Dietary supplement use among adults in Malaysia: finding from Malaysian Adults Nutrition Survey (MANS 2014). *Medical Journal of Malaysia*, *70*.

Nordin, N. M., Wei, J. W. H., Naing, N. N., & Symonds, E. M. (2006). Comparison of maternal-fetal outcomes in gestational diabetes and lesser degrees of glucose intolerance. *The Journal of Obstetrics and Gynaecology Research*, *32*(1), 107–114. http://doi.org/10.1111/j.1447-0756.2006.00360.x

Norimah, A. K., Safiah, M., Jamal, K., Haslinda, S., Zuhaida, H., Rohida, S., … Azmi, M. Y. (2008). Food Consumption Patterns: Findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysian Journal of Nutrition*, *14*(1), 25–39. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/22691762

O'Sullivan, J., & Mahan, C. (1964). Criteria for the oral glucose tolerance test in pregnancy. *Diabetes*, *13*, 278–285.

Ogonowski, J., & Miazgowski, T. (2010). Are short women at risk for gestational diabetes mellitus? *European Journal of Endocrinology / European Federation of Endocrine Societies*, *162*(3), 491–7. http://doi.org/10.1530/EJE-09-0992

Oken, E. (2013). Secular trends in birthweight. In *Nestle Nutrition Institute Workshop Series* (Vol. 71, pp. 103–114). http://doi.org/10.1159/000342576

Oken, E., Ning, Y., Rifas-Shiman, S. L., Radesky, J. S., Rich-Edwards, J. W., & Gillman, M. W. (2006). Associations of physical activity and inactivity before and during pregnancy with glucose tolerance. *Obstetrics and Gynecology*, *108*(5), 1200–7. http://doi.org/10.1097/01.AOG.0000241088.60745.70

Oken, E., Taveras, E. M., Kleinman, K. P., Rich-Edwards, J. W., & Gillman, M. W. (2007). Gestational weight gain and child adiposity at age 3 years. *American Journal of Obstetrics and Gynecology*, *196*(4). http://doi.org/10.1016/j.ajog.2006.11.027

Oostdam, N., van Poppel, M. N. M., Wouters, M., Eekhoff, E. M. W., Bekedam, D. J., Kuchenbecker, W. K. H., … van Mechelen, W. (2012). No effect of the FitFor2 exercise programme on blood glucose, insulin sensitivity, and birthweight in pregnant women who were overweight and at risk for gestational diabetes: results of a randomised controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, *119*(9), 1098–1107. http://doi.org/10.1111/j.1471-0528.2012.03366.x

Oppong, S. A., Ntumy, M. Y., Amoakoh-Coleman, M., Ogum-Alangea, D., & Modey-Amoah, E. (2015). Gestational diabetes mellitus among women attending prenatal care at Korle-Bu Teaching Hospital, Accra, Ghana. *International Journal of Gynecology & Obstetrics*, *131*(3), 246–250. http://doi.org/10.1016/j.ijgo.2015.05.029

Ovesen, P., Jensen, D., Damm, P., Rasmussen, S., & Kesmodel, U. (2014). Maternal and neonatal outcomes in pregnancies complicated by gestational diabetes. A nation-wide study. *The Journal of Maternal-Fetal & Neonatal Medicine : The Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*, *7058*(July 2016), 1–14. http://doi.org/10.3109/14767058.2014.966677

Panel, I. A. of D. and P. S. G. C. (2010). International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. *Diabetes Care* , *33*(3), 676–682. http://doi.org/10.2337/dc09-1848

Papachatzi, E., Dimitriou, G., Dimitropoulos, K., & Vantarakis, A. (2013). Pre-pregnancy obesity: Maternal, neonatal and childhood outcomes. *Journal of Neonatal-Perinatal Medicine*. http://doi.org/10.3233/NPM-1370313

Park, S., Kim, M. H., & Kim, S. H. (2014). Early gestational weight gains within current recommendations result in increased risk of gestational diabetes mellitus among Korean women. *Diabetes/Metabolism Research and Reviews*, *30*(8), 716–725. http://doi.org/10.1002/dmrr.2540

Peña-Rosas, J. P., & Viteri, F. E. (2009). Effects and safety of preventive oral iron or iron+folic acid supplementation for women during pregnancy. *Cochrane Database of Systematic Reviews (Online)*, (4), CD004736. http://doi.org/10.1002/14651858.CD004736.pub3

Peppa, M., Goldberg, T., Cai, W., Rayfield, E., & Vlassara, H. (2002, October). Glycotoxins: a missing link in the "relationship of dietary fat and meat intake in relation to risk of type 2 diabetes in men". *Diabetes Care*. United States.

Perkins, N. J., & Schisterman, E. F. (2006). The inconsistency of "optimal" cutpoints obtained using two criteria based on the receiver operating characteristic curve. *American Journal of Epidemiology*, *163*(7), 670–675. http://doi.org/10.1093/aje/kwj063

Pietraszek, A., Gregersen, S., & Hermansen, K. (2010). Alcohol and type 2 diabetes. A review. *Nutrition, Metabolism, and Cardiovascular Diseases : NMCD*, *20*(5), 366–75. http://doi.org/10.1016/j.numecd.2010.05.001

Pintaudi, B., Lucisano, G., Pellegrini, F., D'Ettorre, A., Lepore, V., De Berardis, G., … Nicolucci, A. (2015). The long-term effects of stillbirth on women with and without gestational diabetes: a population-based cohort study. *Diabetologia*, *58*(1), 67–74. http://doi.org/10.1007/s00125-014-3403-9

Pirjani, R., Shirzad, N., Qorbani, M., Phelpheli, M., Nasli-Esfahani, E., Bandarian, F., & Hemmatabadi, M. (2016). Gestational diabetes mellitus its association with obesity: a prospective cohort study. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 1–6. article. http://doi.org/10.1007/s40519-016-0332-2

Poitout, V., Amyot, J., Semache, M., Zarrouki, B., Hagman, D., & Fontés, G. (2010). Glucolipotoxicity of the pancreatic beta cell. *Biochimica et Biophysica Acta*, *1801*(3), 289–98. http://doi.org/10.1016/j.bbalip.2009.08.006

Polhamus, B., Dalenius, K., Mackentosh, H., Smith, B., & Grummer-Strawn, L. (2009). *Pediatric Nutrition Surveillance 2008 Report*. *Centers for Disease Control and Prevention*. Atlanta: U.S. Department of Health and Human Services: Centers for Disease Control and Prevention.

Polin, R. A., Fox, W. W., & Abman, S. H. (2011). *Fetal and Neonatal Physiology*. Elsevier Health Sciences. Retrieved from https://books.google.com.my/books?id=38X8Kc_YMMUC

Pongcharoen, T., Gowachirapant, S., Wecharak, P., Sangket, N., & Winichagoon, P. (2016). Pre-pregnancy body mass index and gestational weight gain in Thai pregnant women as risks for low birth weight and macrosomia. *Asia Pacific Journal of Clinical Nutrition*, *25*(4), 810–817. http://doi.org/10.6133/apjcn.092015.41

Prentice, R. L., Pettinger, M. B., Jackson, R. D., Wactawski-Wende, J., Lacroix, A. Z., Anderson, G. L., … Rossouw, J. E. (2013). Health risks and benefits from calcium and vitamin D supplementation: Women's Health Initiative clinical trial and cohort study. *Osteoporosis International*, *24*(2), 567–580. http://doi.org/10.1007/s00198-012-2224-2

Qiu, C., Frederick, I. O., Zhang, C., Sorensen, T. K., Enquobahrie, D. A., & Williams, M. A. (2011). Risk of gestational diabetes mellitus in relation to maternal egg and cholesterol intake. *American Journal of Epidemiology*, *173*(6), 649–658. http://doi.org/10.1093/aje/kwq425

Qiu, C., Zhang, C., Gelaye, B., Enquobahrie, D. A., Frederick, I. O., & Williams, M. A. (2011). Gestational diabetes mellitus in relation to maternal dietary heme iron and nonheme iron intake. *Diabetes Care*, *34*(7), 1564–1569. http://doi.org/10.2337/dc11-0135

Radesky, J. S., Oken, E., Rifas-Shiman, S. L., Kleinman, K. P., Rich-Edwards, J. W., & Gillman, M. W. (2008). Diet during early pregnancy and development of gestational diabetes. *Paediatric and Perinatal Epidemiology*, *22*(1), 47–59. http://doi.org/10.1111/j.1365-3016.2007.00899.x

Randall, E., Marshall, J. R., Graham, S., & Brasure, J. (1990). Patterns in food use and their associations with nutrient intakes. *The American Journal of Clinical Nutrition* , *52*(4), 739–745. Retrieved from http://ajcn.nutrition.org/content/52/4/739.abstract

Recommended Nutrient Intakes for Malaysia. (2005). Putrajaya: Ministry of Health Malaysia.

Redden, S. L., LaMonte, M. J., Freudenheim, J. L., & Rudra, C. B. (2011). The association between gestational diabetes mellitus and recreational physical activity. *Maternal and Child Health Journal*, *15*(4), 514–519. http://doi.org/10.1007/s10995-010-0586-7

Renault, K. M., Carlsen, E. M., Nørgaard, K., Nilas, L., Pryds, O., Secher, N. J., … Halldorsson, T. I. (2015). Intake of carbohydrates during pregnancy in obese women is associated with fat mass in the newborn offspring. *American Journal of Clinical Nutrition*, *102*(6), 1475–1481. http://doi.org/10.3945/ajcn.115.110551

Restall, A., Taylor, R. S., Thompson, J. M. D., Flower, D., Dekker, G. a., Kenny, L. C., … McCowan, L. M. E. (2014). Risk factors for excessive gestational weight gain in a healthy, nulliparous cohort. *Journal of Obesity*, *2014*(Table 1). http://doi.org/10.1155/2014/148391

Rios, R. V., Durigan, M., Pessanha, F., Almeida, P. F. De, Viana, C. L., & Caetano, S. (2014). Application of fats in some food products. *Food Science and Technology (Campinas)*, *34*(1), 3–15. http://doi.org/10.1590/S0101-20612014000100001

Risérus, U., Willett, W. C., & Hu, F. B. (2009). Dietary fats and prevention of type 2 diabetes. *Progress in Lipid Research*. http://doi.org/10.1016/j.plipres.2008.10.002

Romero-Corral, A., Somers, V. K., Sierra-Johnson, J., Thomas, R. J., Collazo-Clavell, M. L., Korinek, J., … Lopez-Jimenez, F. (2008). Accuracy of body mass index in diagnosing obesity in the adult general population. *International Journal of Obesity (2005)*, *32*(6), 959–966. http://doi.org/10.1038/ijo.2008.11

Rottenkolber, M., Ferrari, U., Holland, L., Aertsen, S., Kammer, N. N., Hetterich, H., … Lechner, A. (2015). The diabetes risk phenotype of young women with recent gestational diabetes. *Journal of Clinical Endocrinology and Metabolism*, *100*(6), E910–E918. http://doi.org/10.1210/jc.2014-3898

Rudra, C. B., Sorensen, T. K., Leisenring, W. M., Dashow, E., & Williams, M. A. (2007). Weight characteristics and height in relation to risk of gestational diabetes mellitus. *American Journal of Epidemiology*, *165*(3), 302–308. http://doi.org/10.1093/aje/kwk007

Russo, L. M., Nobles, C., Ertel, K. A., Chasan-Taber, L., & Whitcomb, B. W. (2015). Physical activity interventions in pregnancy and risk of gestational diabetes mellitus: A systematic review and meta-analysis. *Obstetrics and Gynecology*, *125*(3), 576–582. http://doi.org/10.1097/AOG.0000000000000691

Sacks, D. A., Greenspoon, J. S., Abu-Fadil, S., Henry, H. M., Wolde-Tsadik, G., & Yao, J. F. F. (1995). Toward universal criteria for gestational diabetes: The 75-gram glucose tolerance test in pregnancy. *American Journal of Obstetrics and Gynecology*, *172*(2 PART 1), 607–614. http://doi.org/10.1016/0002-9378(95)90580-4

Saddki, N., Bachok, N., Hussain, N. H. N., Zainudin, S. L. A., & Sosroseno, W. (2008). The association between maternal periodontitis and low birth weight infants among Malay women. *Community Dentistry and Oral Epidemiology*, *36*(4), 296–304. http://doi.org/10.1111/j.1600-0528.2007.00383.x

Saldana, T. M., Siega-Riz, A. M., & Adair, L. S. (2004). Effect of macronutrient intake on the development of glucose intolerance during pregnancy. *American Journal of Clinical Nutrition*, *79*(3), 479–486.

Saldana, T. M., Siega-Riz, A. M., Adair, L. S., & Suchindran, C. (2006). The relationship between pregnancy weight gain and glucose tolerance status among black and white women in central North Carolina. *American Journal of Obstetrics and Gynecology*, *195*(6), 1629–1635. http://doi.org/10.1016/j.ajog.2006.05.017

Sananpanichkul, P., & Rujirabanjerd, S. (2015). Association between maternal body mass index and weight gain with low birth weight in Eastern Thailand. *The Southeast Asian Journal of Tropical Medicine and Public Health*, *46*(6), 1085–1091.

Sanghvi, T. G., Harvey, P. W. J., & Wainwright, E. (2010). Maternal iron-folic acid supplementation programs: Evidence of impact and implementation. *Food and Nutrition Bulletin*, *31*(2 SUPPL.).

Sargeant, L. a, Khaw, K. T., Bingham, S., Day, N. E., Luben, R. N., Oakes, S., … Wareham, N. J. (2001). Cigarette smoking and glycaemia: the EPIC-Norfolk Study. European Prospective Investigation into Cancer. *International Journal of Epidemiology*, *30*(3), 547–554. http://doi.org/10.1093/ije/30.3.547

Sato, Y., Nakanishi, T., Chiba, T., Yokotani, K., Ishinaga, K., Takimoto, H., … Umegaki, K. (2013). Prevalence of inappropriate dietary supplement use among pregnant women in Japan. *Asia Pacific Journal of Clinical Nutrition*, *22*(1), 83–89. http://doi.org/10.6133/apjcn.2013.22.1.08

Schoenaker, D. A., Soedamah-Muthu, S. S., Callaway, L. K., & Mishra, G. D. (2015). Pre-pregnancy dietary patterns and risk of gestational diabetes mellitus: results from an Australian population-based prospective cohort study. *Diabetologia*, *58*(12), 2726–2735. http://doi.org/10.1007/s00125-015-3742-1

Scholl, T. O., Sowers, M., Chen, X., & Lenders, C. (2001). Maternal glucose concentration influences fetal growth, gestation, and pregnancy complications. *American Journal of Epidemiology*, *154*, 514–520. http://doi.org/10.1093/aje/154.6.514

Schrieks, I. C., Heil, A. L. J., Hendriks, H. F. J., Mukamal, K. J., & Beulens, J. W. J. (2015). The Effect of Alcohol Consumption on Insulin Sensitivity and Glycemic Status: A Systematic Review and Meta-analysis of Intervention Studies. *Diabetes Care*, *38*(4), 723 LP-732. Retrieved from http://care.diabetesjournals.org/content/38/4/723.abstract

Schwartz, N., Nachum, Z., & Green, M. S. (2015). The prevalence of gestational diabetes mellitus recurrence - Effect of ethnicity and parity: A metaanalysis. In *American Journal of Obstetrics and Gynecology* (Vol. 213, pp. 310–317). http://doi.org/10.1016/j.ajog.2015.03.011

Scott-Pillai, R., Spence, D., Cardwell, C., Hunter, A., & Holmes, V. (2013). The impact of body mass index on maternal and neonatal outcomes: a retrospective study in a UK obstetric population, 2004-2011. *BJOG: An International Journal of Obstetrics & Gynaecology*, n/a-n/a. http://doi.org/10.1111/1471-0528.12193

Seghieri, G., De Bellis, A., Anichini, R., Alviggi, L., Franconi, F., & Breschi, M. C. (2005). Does parity increase insulin resistance during pregnancy? *Diabetic Medicine*, *22*(11), 1574–1580. http://doi.org/10.1111/j.1464-5491.2005.01693.x

Sendag, F., Terek, M. C., Itil, I. M., Oztekin, K., & Bilgin, O. (2001). Maternal and perinatal outcomes in women with gestational diabetes mellitus as compared to nondiabetic controls. *J Reprod Med*, *46*(12), 1057–1062.

Seshiah, V., Balaji, V., Balaji, M. S., Paneerselvam, A., Arthi, T., Thamizharasi, M., & Datta, M. (2008). Prevalence of gestational diabetes mellitus in South India (Tamil Nadu)--a community based study. *The Journal of the Association of Physicians of India*, *56*, 329–333. Retrieved from http://www.researchgate.net/publication/23168397_Prevalence_of_gestational_diabetes_mellitus_in_South_India_(Tamil_Nadu)_A_community_based_study

Shamsuddin, K., Mahdy, Z. A., Rafiaah, I. S., Jamil, M. A., & Rahimah, M. D. (2001). Risk factor screening for abnormal glucose tolerance in pregnancy. *International Journal of Gynecology and Obstetrics*, *75*(1), 27–32. http://doi.org/10.1016/S0020-7292(01)00468-4

Shang, M., & Lin, L. (2014). IADPSG criteria for diagnosing gestational diabetes mellitus and predicting adverse pregnancy outcomes. *Journal of Perinatology : Official Journal of the California Perinatal Association*, *34*(2), 100–4. http://doi.org/10.1038/jp.2013.143

Shin, D., Lee, K. W., & Song, W. O. (2015). Dietary patterns during pregnancy are associated with risk of gestational diabetes mellitus. *Nutrients*, *7*(11), 9369–9382. http://doi.org/10.3390/nu7115472

Simcox, J. A., & McClain, D. A. (2013). Iron and diabetes risk. *Cell Metabolism*. http://doi.org/10.1016/j.cmet.2013.02.007

Sina, M., Hoy, W. E., Callaway, L., & Wang, Z. (2015). The associations of anthropometric measurements with subsequent gestational diabetes in Aboriginal women. *Obesity Research and Clinical Practice*, *9*(5), 499–506. http://doi.org/10.1016/j.orcp.2015.02.005

Singh, J., Huang, C.-C., Driggers, R. W., Timofeev, J., Amini, D., Landy, H. J., … Umans, J. G. (2012). The impact of pre-pregnancy body mass index on the risk of gestational diabetes. *The Journal of Maternal-Fetal & Neonatal Medicine : The Official Journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians*, *25*(1), 5–10. http://doi.org/10.3109/14767058.2012.626920

Sirard, J. R., & Pate, R. R. (2001). Physical activity assessment in children and adolescents. *Sports Medicine (Auckland, N.Z.)*, *31*(6), 439–454. http://doi.org/0112-1642/01/0006-0439

Siu, A. L. (2015). Screening for Iron Deficiency Anemia and Iron Supplementation in Pregnant Women to Improve Maternal Health and Birth Outcomes: U.S. Preventive Services Task Force Recommendation Statement. *Annals of Internal Medicine*, *163*(7), 529–536. http://doi.org/10.7326/M15-1707

Sivan, E., Chen, X., Homko, C. J., Reece, E. a, & Boden, G. (1997). Longitudinal study of carbohydrate metabolism in healthy obese pregnant women. *Diabetes Care*, *20*(9), 1470–1475. http://doi.org/10.2337/diacare.20.9.1470

Solomon, C. G., Willett, W. C., Carey, V. J., Rich-Edwards, J., Hunter, D. J., Colditz, G. a, … Manson, J. E. (1997). A prospective study of pregravid determinants of gestational diabetes mellitus. *JAMA : The Journal of the American Medical Association*, *278*(13), 1078–1083. http://doi.org/10.1001/jama.278.13.1078

Sommer, C., Mørkrid, K., Jenum, a K., Sletner, L., Mosdøl, a, & Birkeland, K. I. (2014). Weight gain, total fat gain and regional fat gain during pregnancy and the association with gestational diabetes: a population-based cohort study. *International Journal of Obesity (2005)*, *38*(1), 76–81. http://doi.org/10.1038/ijo.2013.185

Srichumchit, S., Luewan, S., & Tongsong, T. (2015). Outcomes of pregnancy with gestational diabetes mellitus. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics*, *131*(3), 251–4. http://doi.org/10.1016/j.ijgo.2015.05.033

Stafne, S. N., Salvesen, K. Å., Romundstad, P. R., Eggebø, T. M., Carlsen, S. M., & Mørkved, S. (2012). Regular exercise during pregnancy to prevent gestational diabetes: a randomized controlled trial. *Obstetrics and Gynecology*, *119*(1), 29–36. http://doi.org/10.1097/AOG.0b013e3182393f86

Stock, E. O., & Redberg, R. (2012). Cardiovascular Disease in Women. *Current Problems in Cardiology*, *37*(11), 450–526. http://doi.org/10.1016/j.cpcardiol.2012.07.001

Stone, C. a, McLachlan, K. a, Halliday, J. L., Wein, P., & Tippett, C. (2002). Gestational diabetes in Victoria in 1996: incidence, risk factors and outcomes. *The Medical Journal of Australia*, *177*(9), 486–91. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12405890

Storlien, L. H., Pan, D. A., Kriketos, A. D., O'Connor, J., Caterson, I. D., Cooney, G. J., … Baur, L. A. (1996). Skeletal muscle membrane lipids and insulin resistance. *Lipids*, *31 Suppl*, S261–S265. http://doi.org/10.1007/BF02637087

Straube, S., Voigt, M., Briese, V., Schneider, K. T. M., & Voigt, M. (2008). Weight gain in pregnancy according to maternal height and weight. *Journal of Perinatal Medicine*, *36*(5), 405–412. http://doi.org/10.1515/JPM.2008.073

Sumeksri, P., Wongyai, S., & Aimpun, P. (2006). Prevalence of gestational diabetes mellitus (GDM) in pregnant women aged 30 to 34 years old at Phramongkutklao Hospital. *J Med Assoc Thai*, *89*(Suppl 4), S94-9.

Sun, K., Liu, D., Wang, C., Ren, M., Yang, C., & Yan, L. (2014). Passive smoke exposure and risk of diabetes: a meta-analysis of prospective studies. *Endocrine*. http://doi.org/10.1007/s12020-014-0194-1

Sutan, R., Mohtar, M., Mahat, A. N., & Tamil, A. M. (2014). Determinant of Low Birth Weight Infants: A Matched Case Control Study. *Open Journal of Preventive Medicine*, *4*(3), 91–99. http://doi.org/10.4236/ojpm.2014.43013

Tahir, H. M., Ismail, N. N., & Gebbie, D. A. (1991). Low birth weight in Kuala Lumpur. *Asia-Oceania Journal of Obstetrics and Gynaecology / AOFOG*, *17*(2), 135–142. Retrieved from http://search.proquest.com/docview/80735491?accountid=41453

Tan, P. C., Ling, L. P., & Omar, S. Z. (2007). Screening for gestational diabetes at antenatal booking in a Malaysian university hospital: The role of risk factors and threshold value for the 50-g glucose challenge test. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *47*, 191–197. http://doi.org/10.1111/j.1479-828X.2007.00717.x

Targher, G., Franchini, M., Montagnana, M., & Lippi, G. (2007, December). The role of iron in diabetes and its complications: response to Swaminathan et al. *Diabetes Care*. United States. http://doi.org/10.2337/dc07-1633

Teh, W. T., Teede, H. J., Paul, E., Harrison, C. L., Wallace, E. M., & Allan, C. (2011). Risk factors for gestational diabetes mellitus: Implications for the application of screening guidelines. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *51*(1), 26–30. http://doi.org/10.1111/j.1479-828X.2011.01292.x

Tehrani, F. R., Hashemi, S., Hasheminia, M., & Azizi, F. (2012). Follow-up of women with gestational diabetes in the Tehran Lipid and Glucose Study (TLGS): A population-based cohort study. *Journal of Obstetrics and Gynaecology Research*, *38*(4), 698–704. http://doi.org/10.1111/j.1447-0756.2011.01767.x

Tielemans, M. J., Erler, N. S., Leermakers, E. T. M., van den Broek, M., Jaddoe, V. W. V, Steegers, E. A. P., … Franco, O. H. (2015). A Priori and a Posteriori dietary patterns during pregnancy and gestational weight gain: The generation R study. *Nutrients*, *7*(11), 9383–9399. http://doi.org/10.3390/nu7115476

Tieu, J., Middleton, P., McPhee, A. J., & Crowther, C. a. (2010). Screening and subsequent management for gestational diabetes for improving maternal and infant health. *Cochrane Database of Systematic Reviews (Online)*, (7), CD007222. http://doi.org/10.1002/14651858.CD007222.pub2

Tobias, D. K., Zhang, C., Chavarro, J., Bowers, K., Rich-Edwards, J., Rosner, B., … Hu, F. B. (2012). Prepregnancy adherence to dietary patterns and lower risk of gestational diabetes mellitus. *The American Journal of Clinical Nutrition*, *96*(2), 289–95. http://doi.org/10.3945/ajcn.111.028266

Tobias, D. K., Zhang, C., Chavarro, J., Bowers, K., Rich-Edwards, J., Rosner, B., … Hu, F. B. (2012). Prepregnancy adherence to dietary patterns and lower risk of gestational diabetes mellitus. *American Journal of Clinical Nutrition*, *96*(2), 289–295. http://doi.org/10.3945/ajcn.111.028266.INTRODUCTION

Tobias, D. K., Zhang, C., Van Dam, R. M., Bowers, K., & Hu, F. B. (2011). Physical activity before and during pregnancy and risk of gestational diabetes mellitus: A meta-analysis. *Diabetes Care*, *34*(1), 223–229. http://doi.org/10.2337/dc10-1368

Tomedi, L. E., Simhan, H. N., Chang, C. C. H., McTigue, K. M., & Bodnar, L. M. (2014). Gestational weight gain, early pregnancy maternal adiposity distribution, and maternal hyperglycemia. *Maternal and Child Health Journal*, *18*(5), 1265–1270. http://doi.org/10.1007/s10995-013-1361-3

Torloni, M. R., Betran, A. P., Horta, B. L., Nakamura, M. U., Atallah, A. N., Moron, A. F., & Valente, O. (2009). Prepregnancy BMI and the risk of gestational diabetes: a systematic review of the literature with meta-analysis. *Obesity Reviews*, *10*(2), 194–203. http://doi.org/10.1111/j.1467-789X.2008.00541.x; 10.1111/j.1467-789X.2008.00541.x

Tovar, A., Must, A., Bermudez, O. I., Hyatt, R. R., & Chasan-Taber, L. (2009). The impact of gestational weight gain and diet on abnormal glucose tolerance during pregnancy in hispanic women. *Maternal and Child Health Journal*, *13*(4), 520–530. http://doi.org/10.1007/s10995-008-0381-x

Tryggvadottir, E. a, Medek, H., Birgisdottir, B. E., Geirsson, R. T., & Gunnarsdottir, I. (2016). Association between healthy maternal dietary pattern and risk for gestational diabetes mellitus. *European Journal of Clinical Nutrition*, *70*(November 2014), 1–6. http://doi.org/10.1038/ejcn.2015.145

Tsai, I.-H., Chen, C.-P., Sun, F.-J., Wu, C.-H., & Yeh, S.-L. (2011). Associations of the pre-pregnancy body mass index and gestational weight gain with pregnancy outcomes in Taiwanese women. *Asia Pacific Journal of Clinical Nutrition*, *1*(84), 81–85.

Tsui, A. O., McDonald-Mosley, R., & Burke, A. E. (2010). Family planning and the burden of unintended pregnancies. *Epidemiologic Reviews*. http://doi.org/10.1093/epirev/mxq012

Tundidor, D., García-Patterson, A., María, M. A., Ubeda, J., Ginovart, G., Adelantado, J. M., … Corcoy, R. (2012). Perinatal maternal and neonatal outcomes in women with gestational diabetes mellitus according to fetal sex. *Gender Medicine*, *9*(6), 411–417. http://doi.org/10.1016/j.genm.2012.09.002

U.S. Department of Agriculture, A. R. S. (2014). USDA National Nutrient Database for Standard Reference, Release 27. *Nutrient Data Laboratory*, *5*(1), 2–11. Retrieved from http://www.ars.usda.gov/ba/bhnrc/ndl

UNCF/WHO. (2004). *Low Birthweight: Country, regional and global estimates. UNICEF, New York.* (United Nations Children's Fund and World Health Organization, Ed.). UNICEF, New York.

Uvena-Celebrezze, J., & Catalano, P. M. (2000). The infant of the woman with gestational diabetes mellitus. *Clinical Obstetrics and Gynecology*, *43*(1), 127–139.

Valizadeh, M., Alavi, N., Mazloomzadeh, S., Piri, Z., & Amirmoghadami, H. (2015). The risk factors and incidence of type 2 diabetes mellitus and metabolic syndrome in women with previous gestational diabetes. *International Journal of Endocrinology and Metabolism*, *13*(2). http://doi.org/10.5812/ijem.21696

Van Dam, R. M., Willett, W. C., Rimm, E. B., Stampfer, M. J., & Hu, F. B. (2002). Dietary fat and meat intake in relation to risk of type 2 diabetes in men. *Diabetes Care*, *25*(3), 417–424. http://doi.org/10.2337/diacare.25.3.417

Verbeke, W., & De Bourdeaudhuij, I. (2007). Dietary behaviour of pregnant versus non-pregnant women. *Appetite*, *48*(1), 78–86. http://doi.org/10.1016/j.appet.2006.07.078

Vincenzo, D. T. (2014). Age-related impairment of pancreatic beta-cell function: Pathophysiological and cellular mechanisms. *Frontiers in Endocrinology*. http://doi.org/10.3389/fendo.2014.00138

Voldner, N., Qvigstad, E., Froslie, K. F., Godang, K., Henriksen, T., & Bollerslev, J. (2010). Increased risk of macrosomia among overweight women with high gestational rise in fasting glucose. *J Matern Fetal Neonatal Med*, *23*(1), 74–81. http://doi.org/10.3109/14767050903121472

Wahabi, H. A., Fayed, A. A., Alzeidan, R. A., & Mandil, A. A. (2014). The independent effects of maternal obesity and gestational diabetes on the pregnancy outcomes. *BMC Endocrine Disorders*, *14*(1), 47. http://doi.org/10.1186/1472-6823-14-47

Wahi, P., Dogra, V., Jandial, K., Bhagat, R., Gupta, R., Gupta, S., … Singh, J. (2011). Prevalence of gestational diabetes mellitus (GDM) and its outcomes in Jammu region. *Journal of Association of Physicians of India*, *59*(4), 227–230.

Walczyk, T., Muthayya, S., Wegmuller, R., Thankachan, P., Sierksma, A., Frenken, L. G. J., … Hurrell, R. F. (2014). Inhibition of iron absorption by calcium is modest in an iron-fortified, casein- and whey-based drink in Indian children and is easily compensated for by addition of ascorbic acid. *The Journal of Nutrition*, *144*(11), 1703–1709. http://doi.org/10.3945/jn.114.193417

Wallace, R. B., Wactawski-Wende, J., O'Sullivan, M. J., Larson, J. C., Cochrane, B., Gass, M., & Masaki, K. (2011). Urinary tract stone occurrence in the Women's Health Initiative (WHI) randomized clinical trial of calcium and vitamin D supplements. *American Journal of Clinical Nutrition*, *94*(1), 270–277. http://doi.org/10.3945/ajcn.110.003350

Walsh, J. M., Mahony, R., Byrne, J., Foley, M., & McAuliffe, F. M. (2011). The association of maternal and fetal glucose homeostasis with fetal adiposity and birthweight. *European Journal of Obstetrics Gynecology and Reproductive Biology*, *159*(2), 338–341. http://doi.org/10.1016/j.ejogrb.2011.09.022

Walter, J. R., Perng, W., Kleinman, K. P., Rifas-Shiman, S. L., Rich-Edwards, J. W., & Oken, E. (2015). Associations of trimester-specific gestational weight gain with maternal adiposity and systolic blood pressure at 3 and 7 years postpartum. *American Journal of Obstetrics and Gynecology*, *212*(4), 499.e1-499.e12. http://doi.org/10.1016/j.ajog.2014.11.012

Wang, Y., Ji, J., Liu, Y., Deng, X., & He, Q. (2013). Passive smoking and risk of type 2 diabetes: a meta-analysis of prospective cohort studies. *PloS One*, *8*(7), e69915. http://doi.org/10.1371/journal.pone.0069915

Wannamethee, S. G., Camargo, C. A., Manson, J. E., Willett, W. C., & Rimm, E. B. (2003). Alcohol drinking patterns and risk of type 2 diabetes mellitus among younger women. *Archives of Internal Medicine*, *163*(11), 1329–36. http://doi.org/10.1001/archinte.163.11.1329

Wei, Y. M., Yang, H. X., Zhu, W. W., Liu, X. Y., Meng, W. Y., Wang, Y. F. Q., … Yu, L. J. (2016). Risk of adverse pregnancy outcomes stratified for pre-pregnancy body mass index. *Journal of Maternal-Fetal and Neonatal Medicine*, *29*(13), 2205–2209. http://doi.org/http://dx.doi.org/10.3109/14767058.2015.1081167

Weisman, C. S., Hillemeier, M. M., Symons Downs, D., Chuang, C. H., & Dyer, A. M. (2010). Preconception Predictors of Weight Gain During Pregnancy. Prospective Findings from the Central Pennsylvania Women's Health Study. *Women's Health Issues*, *20*(2), 126–132. http://doi.org/10.1016/j.whi.2009.12.002

Weissmann-Brenner, A., Simchen, M. J., Zilberberg, E., Kalter, A., Weisz, B., Achiron, R., & Dulitzky, M. (2012). Maternal and neonatal outcomes of large for gestational age pregnancies. *Acta Obstetricia et Gynecologica Scandinavica*, *91*(7), 844–849. http://doi.org/10.1111/j.1600-0412.2012.01412.x

Wendland, E. M., Duncan, B. B., Mengue, S. S., Nucci, L. B., & Schmidt, M. I. (2007). Waist circumference in the prediction of obesity-related adverse pregnancy outcomes. *Cadernos de Saude Publica*, *23*(2), 391–398. http://doi.org/10.1590/S0102-311X2007000200015

WHO. (1995). *Physical status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee.* (World Health Organization, Ed.). Geneva: WHO Technical Report Series No. 854.

WHO. (1998). *Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation on Obesity*. (World Health Organization, Ed.). Geneva.

WHO. (2006). *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia: report of a WHO/IDF consultation*. (World Health Organization, Ed.), *Geneva: World Health Organisation*. Geneva. Retrieved from http://whqlibdoc.who.int/publications/2006/9241594934_eng.pdf%5Cnhttp://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Definition+and+diagnosis+of+diabetes+mellitus+and+intermediate+hyperglycemia:+report+of+a+WHO/IDF+consultation#0

WHO. (2011a). *Guideline : Intermittent iron and folic acid supplementation in menstruating women. World Health Organization*. http://doi.org/10.1100/tsw.2010.188

WHO. (2011b). *Waist Circumference and Waist–Hip Ratio*. *WHO Expert* (Vol. 64). Retrieved from http://www.nature.com/doifinder/10.1038/ejcn.2009.139

WHO. (2012). Low Birth Weight. *University of Maryland Medical Center*, 1–8. http://doi.org/10.1001/jama.287.2.270

WHO. (2013). Diagnostic Criteria and Classification of Hyperglycaemia First Detected in Pregnancy. *World Health Organization*, 1–63. http://doi.org/10.1016/j.diabres.2013.10.012

WHO, W. H. O. (2007). Standards for Maternal and Neonatal Care. *WHO Library*, 1–72.

WHO, W. H. O., & Consultation, W. H. O. (1999). *Definition, diagnosis and classification of diabetes mellitus and its complications*. *Geneva, Switzerland: World Health Organization* (Vol. 31). Retrieved from https://notendur.hi.is/~rafn/itarefni/fraedigreinar/diagnosisofdiabetesmellitus(who).doc

Wiles, R. (1998). The views of women of above average weight about appropriate weight gain in pregnancy. *Midwifery*, *14*(4), 254–260. http://doi.org/10.1016/S0266-6138(98)90098-5

Williams, P. G., Grafenauer, S. J., & O'Shea, J. E. (2008). Cereal grains, legumes, and weight management: A comprehensive review of the scientific evidence. *Nutrition Reviews*. http://doi.org/10.1111/j.1753-4887.2008.00022.x

Wojtyla, A., Kapka-Skrzypczak, L., Paprzycki, P., Skrzypczak, M., & Bilinski, P. (2012). Epidemiological studies in Poland on effect of physical activity of pregnant women on the health of offspring and future generations - adaptation of the hypothesis development origin of health and diseases. *Annals of Agricultural and Environmental Medicine : AAEM*, *19*(2), 315–326.

Wolfe, H. M., Zador, I. E., Gross, T. L., Martier, S. S., & Sokol, R. J. (1991). The clinical utility of maternal body mass index in pregnancy. *American Journal of Obstetrics and Gynecology*, *164*(5 Pt 1), 1306–1310.

World Health Organization. (1999). *Definition, Diagnosis and Classification of Diabetes Mellitus. Part 1: Diagnosis and Classification of Diabetes Mellitus. Geneva, WHO.*

World Health Organization. (2010). *International Statistical Classification of Diseases and Related Health Problems: Instruction manual. Family practice management* (Vol. 2). Geneva: World Health Organization. Retrieved from http://apps.who.int/classifications/icd10/browse/2015/en

Xiao-Hua, L., Fei-Fei, Y., Yu-Hao, Z., & Jia, H. (2016). Association between alcohol consumption and the risk of incident type 2 diabetes: a systematic review and dose-response meta-analysis. *The American Journal of Clinical Nutrition*, *103*(3), 818–29. http://doi.org/10.3945/ajcn.115.114389

Xu, Q., Gao, Z. Y., Li, L. M., Wang, L., Zhang, Q., Teng, Y., … Lu, Y. P. (2016). The Association of Maternal Body Composition and Dietary Intake with the Risk of Gestational Diabetes Mellitus during the Second Trimester in a Cohort of Chinese Pregnant Women. *Biomedical and Environmental Sciences : BES*, *29*(1), 1–11. http://doi.org/10.3967/bes2016.001

Yadav, H., & Lee, N. (2013). Maternal factors in predicting low birth weight babies. *Med J Malaysia*, *68*(1), 44–47. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/23466766

Yakoob, M. Y., & Bhutta, Z. A. (2011). Effect of routine iron supplementation with or without folic acid on anemia during pregnancy. *BMC Public Health*, *11 Suppl 3*(Suppl 3), S21. http://doi.org/10.1186/1471-2458-11-S3-S21

Yang, H., Wei, Y., Gao, X., Xu, X., Fan, L., He, J., … China National GDM Survey Working Group. (2009). Risk factors for gestational diabetes mellitus in Chinese women: a prospective study of 16,286 pregnant women in China. *Diabetic Medicine : A Journal of the British Diabetic Association*, *26*(11), 1099–104. http://doi.org/10.1111/j.1464-5491.2009.02845.x

Yang, J., Dang, S., Cheng, Y., Qiu, H., Mi, B., Jiang, Y., … Yan, H. (2016). Dietary intakes and dietary patterns among pregnant women in Northwest China. *Public Health Nutrition*, 1–12. http://doi.org/10.1017/S1368980016002159

Yang, S., Peng, A., Wei, S., Wu, J., Zhao, J., Zhang, Y., … Zhang, B. (2015). Pre-pregnancy body mass index, gestational weight gain, and birth weight: A cohort study in China. *PLoS ONE*, *10*(6). http://doi.org/10.1371/journal.pone.0130101

Yang, X., Hsu-Hage, B., Zhang, H., Zhang, C. C., Zhang, Y., & Zhang, C. C. (2002). Women with impaired glucose tolerance during pregnancy have significantly poor pregnancy outcomes. *Diabetes Care*, *25*(9), 1619–1624. http://doi.org/10.2337/diacare.25.9.1619

Yang, X., Hsu-Hage, B., Zuang, H., Yu, L., Dong, L., Li, J., … Zhang, C. (2002). Gestational diabetes mellitus in women of single gravidity in Tianjin City, China. *Diabetes Care*, *25*(5), 847–851. http://doi.org/10.2337/diacare.25.5.847

Yeung, E. H., Hu, F. B., Solomon, C. G., Chen, L., Louis, G. M., Schisterman, E., … Zhang, C. (2010). Life-course weight characteristics and the risk of gestational diabetes. *Diabetologia*, *53*(4), 668–678. http://doi.org/10.1007/s00125-009-1634-y

Yilmaz, O., Kucuk, M., Ilgin, A., & Dagdelen, M. (2010). Assessment of insulin sensitivity/resistance and their relations with leptin concentrations and anthropometric measures in a pregnant population with and without gestational diabetes mellitus. *Journal of Diabetes and Its Complications*, *24*(2), 109–114. http://doi.org/10.1016/j.jdiacomp.2009.01.006

Yin, Y.-N., Li, X.-L., Tao, T.-J., Luo, B.-R., & Liao, S.-J. (2013). Physical activity during pregnancy and the risk of gestational diabetes mellitus: a systematic review and meta-analysis of randomised controlled trials. *British Journal of Sports Medicine*, *48*(4), 290–5. http://doi.org/10.1136/bjsports-2013-092596

Yong, H. Y., Mohd Shariff, Z., Koo, S. J., & Binti Sa'ari, N. S. (2016). Pre-pregnancy body mass index, height and physical activity are associated with rate of gestational weight gain among Malaysian mothers. *The Journal of Obstetrics and Gynaecology Research*, *42*(9), 1094–1101. http://doi.org/10.1111/jog.13039

Yusof, B. N. M., Talib, R. A., & Karim, N. A. (2005). Glycaemic index of eight types of commercial rice in Malaysia. *Malaysian J Nut*, *11*, 151–163.

Zhang, C. (2010). Risk Factors for Gestational Diabetes: from an Epidemiological Standpoint. In C. Kim & A. Ferrara (Eds.), *Gestational Diabetes During and After Pregnancy* (pp. 71–81). London: Springer London. http://doi.org/10.1007/978-1-84882-120-0_5

Zhang, C., Liu, S., Solomon, C. G., & Hu, F. B. (2006). Dietary fiber intake, dietary glycemic load, and the risk for gestational diabetes mellitus. *Diabetes Care*, *29*(10), 2223–2230. http://doi.org/10.2337/dc06-0266

Zhang, C., & Ning, Y. (2011). Effect of dietary and lifestyle factors on the risk of gestational diabetes: review of epidemiologic evidence. *American Journal of Clinical Nutrition*, *94*(6_Suppl), 1975S–1979S. http://doi.org/10.3945/ajcn.110.001032

Zhang, C., Schulze, M. B., Solomon, C. G., & Hu, F. B. B. (2006). A prospective study of dietary patterns, meat intake and the risk of gestational diabetes mellitus. *Diabetologia*, *49*(11), 2604–2613. http://doi.org/10.1007/s00125-006-0422-1

Zhang, L., Curhan, G. C., Hu, F. B., Rimm, E. B., & Forman, J. P. (2011). Association between passive and active smoking and incident type 2 diabetes in women. *Diabetes Care*, *34*(4), 892–897. http://doi.org/10.2337/dc10-2087

Zhang, Y.-J., Jin, H., Qin, Z.-L., Ma, J.-L., Zhao, H., Zhang, L., & Chen, Z.-J. (2015). Predictors of Gestational Diabetes Mellitus in Chinese Women with Polycystic Ovary Syndrome: A Cross-Sectional Study. *Gynecologic and Obstetric Investigation*. http://doi.org/10.1159/000440618

Zhang, Y., Peck, K., Spalding, M., Xu, T., & Ragain, M. (2010). A study to examine the attitudes, knowledge, and utilization of CAM by primary care professional in West Texas. *Complementary Therapies in Medicine*, *18*, 227–232. http://doi.org/10.1016/j.ctim.2010.09.009

Zhu, B., Wu, X., Wang, X., Zheng, Q., & Sun, G. (2014). The association between passive smoking and type 2 diabetes: a meta-analysis. *Asia-Pacific Journal of Public Health / Asia-Pacific Academic Consortium for Public Health*, *26*(3), 226–237. http://doi.org/10.1177/1010539514531041