UNIVERSITI PUTRA MALAYSIA

EFFECTS OF LOW GLYCEMIC INDEX DIETARY INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES MELLITUS

FARHANAH BINTI AHMAD SHUHAIMI

FPSK(m) 2015 28

EFFECTS OF LOW GLYCEMIC INDEX DIETARY INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES MELLITUS

By

FARHANAH BINTI AHMAD SHUHAIMI

Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Master of Science

December 2015

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

EFFECTS OF LOW GLYCEMIC INDEX DIETARY INTERVENTION IN WOMEN WITH GESTATIONAL DIABETES MELLITUS

By

FARHANAH BINTI AHMAD SHUHAIMI

December 2015

Chair : Barakatun Nisak Binti Mohd Yusof, PhD
Faculty : Medicine and Health Sciences

High maternal glycemia especially at the postprandial level have been associated with high rates of complications in women with Gestational Diabetes Mellitus (GDM). A low glycemic index (LGI) diet may offer some benefits since the LGI foods usually produce lower postprandial blood glucose (PPG) responses as compared to high GI (HGI) foods. This randomized controlled study was conducted to investigate the effect of a LGI diet on glycemic-related parameters, other metabolic responses and dietary intake in women with GDM.

A total of 40 participants (aged 32 years; mean ± SD pre-pregnancy Body Mass Index (BMI) 29.3 kg/m^2 ± 7.3; mean ± SD gestation age = 26 week ± 3.5) from Universiti Kebangsaan Malaysia Medical Centre (UKMMC) were randomized to either LGI group (n=20) or Standard Nutrition Therapy (SNT) (n=20) groups to receive intensive intervention in which the outcomes were measured after 4-weeks period. As part of the study, the acute study was performed at week 1, 2 and 4 to determine the acute effects of LGI and HGI meal on postprandial metabolic responses (at week 1 and 2) and to challenge the postprandial response after having intensive intervention at week 4.

At baseline, participants in both groups were homogenous. At 4 weeks, both groups reduced the fructosamine levels ($p<0.05$) with no different detected between group. LGI intervention had significantly better reduction on self-monitoring blood glucose (SMBG) at 1-hour post breakfast by 11.8% recorded at home than the participants in the SNT group ($p<0.05$). No significant different were reported in lipid profile and C- Reactive Protein (CRP) between both groups after the 4 weeks of intensive intervention. Dietary Glycemic Index (GI) of participants in LGI group was significant lower by 7 units than SNT group ($p<0.05$). In the acute study, the 3-hours PPG was significantly lower after consuming low glycemic index meal (LGI_M) than the high glycemic index meal (HGI_M). The 4 weeks of LGI dietary intervention however, was not able to improve the PPG and triglyceride response after re-challenge with HGI_M at the end of the study.

In conclusion, LGI dietary intervention was able to improve SMBG at 1-hour post breakfast. A LGI diet was feasible in this study, as the dietary GI in LGI

group has reduced significantly at the end of the study. The improvement in PPG was also evident after having LGI meals as compared to HGI meals in women with GDM.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

KESAN INTERVENSI DIET RENDAH GLISEMIK INDEKS DI KALANGAN WANITA YANG MEMPUNYAI GESTASI DIABETES MELLITUS

Oleh

FARHANAH BINTI AHMAD SHUHAIMI

Disember 2015

Pengerusi : Barakatun Nisak Binti Mohd Yusof, PhD
Fakulti : Perubatan dan Sains Kesihatan

Paras glisemia ibu yang tinggi terutama sekali selepas makan telah dikaitkan dengan kadar tinggi mendapat komplikasi bagi wanita yang mempunyai diabetes mellitus semasa hamil (GDM). Diet indeks glisemik rendah (LGI) mungkin menawarkan kebaikan memandangkan makanan rendah indeks glisemik biasanya menghasilkan paras glukosa selepas makan (PPG) yang rendah berbanding makanan yang tinggi GI (HGI). Kajian terkawal secara rawak ini dijalankan bagi mengkaji kesan diet LGI ke atas parameter berkaitan glukosa, tindak balas metabolik yang lain dan pengambilan diet dalam kalangan ibu mengandung yang mempunyai GDM.

Seramai 40 orang peserta (berumur 32 tahun; mean ± SD Indeks Jisim Badan (BMI) sebelum hamil 29.3 ± 7.3 kg/m^2; min ± SD usia kehamilan = 26 minggu ± 3.5) dari Pusat Perubatan Universiti Kebangsaan Malaysia (PPUKM) telah ditempatkan secara rawak sama ada dalam kumpulan LGI (n=20) atau Piawai Terapi Pemakanan (SNT) (n=20) untuk intervensi intensif di mana kesannya akan dilihat selepas 4 minggu. Sebagai sebahagian dari kajian ini, kajian akut telah dijalankan pada minggu 1, 2 dan 4 bagi menentukan kesan akut makanan rendah GI dan tinggi GI (HGI) terhadap tindakbalas metabolik selepas makan (minggu 1 dan 2) dan untuk mencabar tindak balas metabolik selepas makan selepas menjalani intervensi intensif pada minggu 4.

Pada garis asas, peserta dari kedua-dua kumpulan adalah homogen. Pada minggu ke- 4, paras fruktosamin pada kedua-dua kumpulan telah menurun ($p<0.05$) tanpa ada perbezaan di antara kumpulan. Intervensi LGI telah memberi penurunan yang lebih baik sebanyak 11.8% secara signifikan berbanding kumpulan SNT pada pemeriksaan glukosa dalam darah secara sendiri (SMBG) yang dilakukan di rumah pada 1 jam selepas sarapan. ($p<0.05$). Tiada sebarang perbezaan signifikan dilaporkan dalam profil lipid dan protein C-reactive (CRP) di antara kedua-dua kumpulan selepas intervensi intensif selama 4 minggu. GI dietari dalam kalangan peserta LGI adalah 7 unit lebih rendah secara signifikan dari kumpulan SNT ($p<0.05$). Di dalam kajian akut, PPG selama 3 jam adalah lebih rendah secara signifikan selepas makan makanan rendah GI (LGI_M) berbanding makanan tinggi GI (HGI_M). Walaubagaimanapun, intervensi diet selama 4 minggu tidak dapat membaiki

PPG dan tindakbalas trigliserid selepas dicabar semula dengan HGI_M di penghujung kajian.

Kesimpulannya, intervensi diet LGI mampu membaiki SMBG pada 1 jam selepas sarapan. Diet LGI sesuai dilaksanakan di dalam kajian ini kerana GI dietari di dalam kumpulan LGI telah menurun secara signifikan di akhir kajian. Penurunan di dalam PPG juga telah terbukti selepas makan LGI_M berbanding makanan HGI_M dalam kalangan wanita yang mempunyai GDM.

ACKNOWLEDGEMENT

First of all, all the praises and thanks to Allah Almighty for his immense blessing and help provided to me throughout this study. My special thanks to Associate Professor Dr. Barakatun Nisak, my supervisor, for her expertise, guidance, assistance and patience throughout this study. Without her supervision and constant monitoring this study would not have been possible. I would like to thank my committee members, Professor Dr. Zalilah and Professor Dr. Nor Azlin for serving me as my co-supervisor. Not forgotten, special thanks to my co-researcher, Associate Professor Dr. Norlaila Mustafa. Thank you for the support, insights and generosity throughout the study process.

I would especially like to thank physicians, nurses, laboratory staffs in the Obstetric & Gynecology (O&G) and Endocrine Laboratory at Universiti Kebangsaan Malaysia Medical Centre (UKMMC). I am tremendously grateful for Noor Hidayah, who assisted me in data collection throughout the study. I am also grateful for En Fadzly Hanaffi Muzayin for editing the language of this thesis. All of you have been there to support me when I recruited patients and collected data for my Master thesis.

A special thanks goes to my family members. Words cannot express how grateful I am to my mother, father and siblings for all of the scarifies that you have made on my behalf. I would like to express my deepest love and gratitude to my husband, Asfarizal. I thank you for your continuous support, patience and love. Thank you for always be by my side and cheering me on to accomplish this goal. My success is yours.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

Barakatun Nisak binti Mohd Yusof, PhD
Senior Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

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

Nor Azlin Binti Mohamed Ismail, BSc, MBChB, DrObGyn
Professor
Faculty of Medicine
Universiti Kebangsaan Malaysia Medical Centre
(Member)

_____

BUJANG KIM HUAT, 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 the 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 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.: Farhanah Binti Ahmad Shuhaimi GS 36503

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: Barakatun Nisak binti Mohd Yusof, PhD

Signature: _____
Name of Chairman of Supervisory Committee: Zalilah binti Mohd Shariff, PhD

Signature: _____
Name of Chairman of Supervisory Committee: Nor Azlin Binti Mohamed Ismail, BSc, MBChB, DrObGyn

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologist
ADA	American Diabetes Association
AUC	Area Under the Curve
BMI	Body Mass Index
BSP	Blood Sugar Profile
CHO	Carbohydrate
CRP	C-Reactive Protein
DAS	Dietary Adherence Scores
FBG	Fasting Blood Glucose
FFA	Free Fatty Acid
FFQ	Food Frequency Questionnaire
GDM	Gestational Diabetes Mellitus
GI	Glycemic Index
GL	Glycemic Load
GLM	General Linear Model
HAPO	Hyperglycemia and Adverse Pregnancy Outcome
HDL	High Density Lipoprotein
HGI	High Glycemic Index
HGI_M	High Glycemic Index Meal
IADPSG	International Association of Diabetes and Pregnancy Study Groups
IAUC	Incremental Area Under the Curve
LDL	Low Density Lipoprotein
LGA	Large for Gestation Age
LGI	Low Glycemic Index
LGI_M	Low Glycemic Index Meal
MNT	Medical Nutrition Therapy
MoH	Ministry of Health
NEFA	Non-Esterified Fatty Acid
NICE	National Institute for Health and Care Excellence
NICHD	The National Institute of Child Health
OGTT	Oral Glucose Tolerant Test
O&G	Obstetrics & Gynecology
PCT	Post Challenge Test
PPG	Maternal Postprandial Blood Glucose
RM	Ringgit Malaysia
RNI	Recommended Nutrient Intake (RNI)
SNT	Standard Nutrition Therapy
SPSS	Statistic Package for Social Sciences
SUNDEC	Sunnybrook Diabetes Education Centre
SMBG	Self-Monitoring Blood Glucose
T2DM	Type 2 Diabetes Mellitus
TEI	Total Energy Intake
UKM MC	Universiti Kebangsaan Malaysia Medical Centre

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Gestational Diabetes Mellitus (GDM) is a state of glucose intolerance that begins or is first detected during pregnancy (ADA, 2004). Most recent studies documented and concluded that GDM occurs in about 7% of all pregnancies ranging from 1% to 14% depending on population and diagnostic tests (ADA, 2014)

The prevalence of GDM in most countries is unknown, but it reflects on the background prevalence of type 2 diabetes mellitus (T2DM) as well as prevalence of pre-diabetes (IGT) in young reproductive women in the given population (Hunt et al., 2007). It is projected that, among several groups categorized as high, the prevalence rate may be as high as 30% (World Diabetes Foundation, 2009). Recent findings discovered that the GDM prevalence has increased by ~10 to 100% in several ethnicities for the past 20 years (Ferrara, 2007).

Maternal diet, especially dietary carbohydrate (CHO) is a major determinant of the maternal postprandial glucose excursion (ADA, 2008). Conventionally, blood glucose management in GDM may take into account the amount of CHO and consistency (ADA, 2007). The 2002 Dietary References Intake Report has documented a minimum of 130g/ day for non-pregnant women and 175g CHO per day for pregnant women. The additional of 33 g of CHO is meant for fetal brain development and functioning (ADA, 2007). This new minimum recommendation provides an essential basis for the level of CHO restriction for women with GDM (de Veciana et al., 1995). Nevertheless, CHO restriction may not be feasible in Asia including in Malaysia as Asian's staple food commonly consists of polished white rice and refined wheat that are high glycemic index (GI) and glycemic load (GL) values (Ludwig, 2002).

CHO restriction is not only the factor affecting postprandial blood glucose response as the type of CHO which known as a concept of GI could also affect postprandial glucose response (ADA, 2008), but the GI values of food, exert a strong influence on blood glucose response. It is reported that serum glucose is 2-folds higher after the consumption of a high GI (HGI) meal compared to a low GI (LGI) meal, although the amount of CHO remained constant (Galgani et al., 2006).

In principal, the GI values of CHO foods can be categorized according to three categories: low GI (≤55), medium GI (56-69) and high GI (≥70) (Kirpitch et al., 2011). Foods with lower GI enter the blood stream at a slower rate, which reduces both the glycemic response and the corresponding insulin release (Kirpitch et al., 2011). According to meta-analyses, there was a modest reduction in HbA1c by 0.27% units (Opperman et al., 2004) and fructosamine

level in diabetic patients who were on LGI dietary intervention (Brand-Miller et al., 2003). Based on the facts stated, there is a positive correlation between consumption of HGI foods and an increases incidence of T2DM (Kirpitch et al., 2011).

1.2 Problem Statement

The increase in maternal glycemic control, especially excessive rise at the postprandial level, even within current recommended target have been associated with a higher rate of maternal and obstetric complications (Medzger et al., 2008).

The impact of LGI diet in women with GDM has been investigated in a few well-designed randomized controlled trial (RCT) that have provided strong proof and evidence. The proof and evidence are well documented in the two studies conducted in Australia (Louie et al., 2011;Moses et al.,2009), one each for Iran (Afaghi et al., 2013), Canada (Grant et al., 2011) and Mexico (Parera et al., 2012). All of these studies suggested that LGI diet might become a new alternative strategy in reducing postprandial blood glucose in women with GDM without to restriction of the dietary CHO (Louie et al., 2011; Afaghi et al., 2013; Moses et al.,2009; Perera et al., 2012; Grant et al., 2011).

Although a number of clinical studies have shown that LGI diet appear to have some beneficial and favorable effects on glycemic control in women with GDM, the findings cannot be generalized to the Asian context because of the genetic, environment and food pattern divergences between Western countries and Asian countries (Barakatun Nisak et al., 2014). 97% of Malaysians consume white rice, which is high in GI value almost every day (Norimah et al., 2008). Studies on the effectiveness of LGI in maternal glycemic control in GDM were all done in Western countries.

Previously, there have been a few GI studies conducted in Malaysia, the studies were focused on T2DM (Barakatun Nisak et al., 2009) and women with history of GDM (Shyam et al., 2013). Although both studies showed positive and encouraging outcomes among the participants in the LGI group, the results could not be applicable to women with GDM as the metabolic response during pregnancy especially those complicated with GDM were totally different including the gastric motility (Wald et al., 1982), and insulin sensitivity (Butte et al., 2000) which influences the rate of CHO digestion and absorption.

To address this research gap, this randomized controlled study is proposed to investigate the effectiveness of the LGI diet on glycemic control for Malaysian women with GDM. This study investigates the effect of a LGI dietary intervention on glycemic-related parameters and metabolic responses in women with GDM.

1.3 Significant of Study

Several findings concluded in Western countries have demonstrated the beneficial effects of LGI food on the glycemic control parameters especially on the postprandial glucose in women with GDM (Grant et al., 2011; Moses et al., 2009; Louie et al., 2013). Additionally, Barakatun Nisak et al. (2009) successfully proven that local food with LGI values produced significantly lower postprandial blood glucose than HGI foods among the patients with diabetes in Malaysia. Suggesting that, LGI diet is feasible for implementation in the management of diabetes in the Malaysian setting.

However at present, there is lack of information and data in the management of women with GDM to incorporate the GI concept in Malaysia. Recognizing the lack of local data on LGI in the management of women with GDM, this research provides firm and strong information on the acute effects of GI on postprandial metabolic response in women with GDM. The outcomes of this study could become a useful dietary guidance for dietitians to incorporate the concept of GI in the management of GDM and will enable better provision of care for pregnant women with GDM in this country.

As this study focused on the effects of LGI diet on glycemic control among women with GDM, the results could help the Ministry of Health (MoH) and dietitians to develop a specific guidelines to initiate the GI concept in managing women with GDM in Malaysia. The findings could also can be used as a reference for other research and health practitioners to help improve the management of women with GDM in future research.

1.4 Research Questions

1. What are the short-term effects of intensive intervention of LGI and standard nutrition therapy (SNT) on maternal glucose-related parameter and other metabolic responses among participants with GDM?
2. What are the acute effects of low versus high GI (HGI) meal on postprandial blood glucose and other metabolic responses among participants with GDM?

1.5 Research Objectives

To investigate the effects of a LGI dietary intervention in women with GDM

1.6 Specific Objectives Are:

1. To compare the baseline characteristics between participants in LGI and SNT group.

2. To compare the effects of LGI against the SNT group on glucose-related parameter as assessed by fasting blood glucose (FBG), fructosamine and self-monitoring blood glucose (SMBG) after 4 weeks of intensive intervention.

3. To compare the effects of LGI against the SNT group on the other metabolic parameters (assessed by lipid profile and C-reactive protein (CRP)), dietary intake and adherence.

4. To compare acute effects of LGI meal (LGI_M) against HGI meals (HGI_M) on metabolic response assessed by capillary blood glucose, venous blood glucose and venous blood triglyceride for 3-hour period at week 1and 4 of the study.

1.7 Hypothesis

1. Participants with GDM in the LGI group achieve significant greater improvement in glucose-related parameter (assessed by FBG, fructosamine and SMBG) than SNT group.

2. Participants with GDM in the LGI group achieve significant greater improvement in other metabolic parameters (assessed by lipid profile and CRP), dietary intake and adherence than SNT group.

3. The LGI meal produces a significant slower rise in posptrandial blood glucose and triglyceride levels than the HGI meal.

1.8 Conceptual Framework

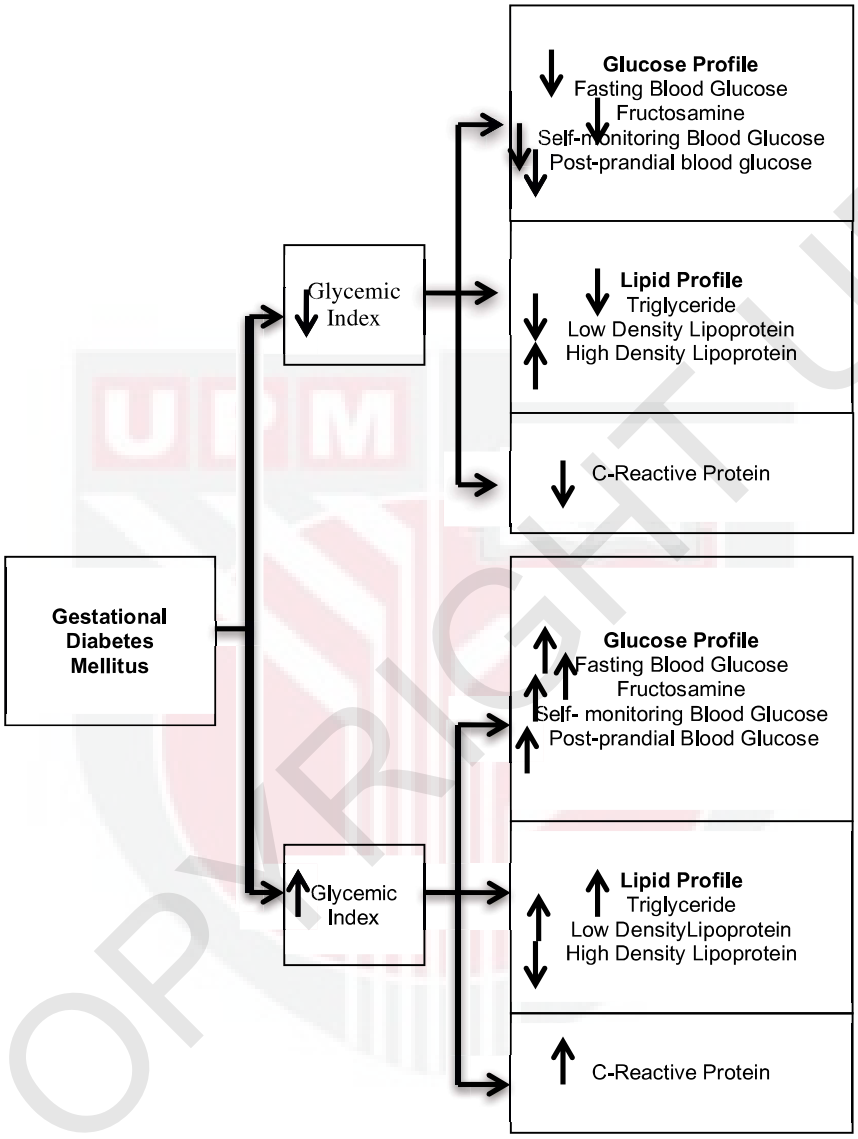

Figure 1.1. Conceptual Framework of the Study

As shown in Figure 1.1, the incorporation of the LGI diet in the dietetic management resulted in a favorable glycemic control (Moses et al., 2009; Grant et al.,2011; Louie et al., 2011; Perera et al., 2012; Afaghi et al., 2013). From previous studies among women with GDM, the glucose-related parameters were assessed by FBG, HbA_{1C}, fructosamine, and PPG (Moses et al., 2009; Grant et al.,2011; Louie et al., 2011; Perera et al., 2012; Afaghi et al., 2013).

Theoretically, CHO-rich foods with HGI value have been demonstrated to be more rapidly digested and absorbed, resulting greater fluctuations in PPG as compared to foods with lower GI values (Jenkins et al., 1987). In addition, LGI foods induced earlier hyperinsulinaemia compared to HGI foods resulting in more rapid glucose removal from the circulation (Jenkins et al., 1987).

Previous study has shown a significant reduction in SMBG and improvement in postprandial SMBG among women in the LGI group who have had pre-pregnancy ≥25kg/m^2 (Grant et al., 2011). Furthermore, Perera et al. (2012) showed that, LGI has successfully reduced the FBG and achieved glycemic goals in 2-hPPG at lunch, pre-prandial and 2hr postprandial glucose at dinner towards the end of pregnancy.

Apart from observing the effect of LGI on glucose profile, this study was also investigating the effect of LGI diet on other metabolic parameters as assessed by triglyceride, High-Density Lipoprotein (HDL) and Low-Density Lipoprotein (LDL) cholesterol and CRP levels.

Interestingly, LGI not only influences postprandial blood glucose but also gives an impact to lipid profile and CRP level. Based on previous research, LGI diet may result in lower LDL cholesterol and improved HDL cholesterol (Helibron et al., 2002) due to the decrease of gluconeogenesis after the ingestion of LGI foods and suppress the release of non-esterified fatty acid (NEFA), which eventually increases the HDL cholesterol levels (Opperman et al., 2004). Another finding suggested that, lowering the GI might decrease the inflammatory response, which can also result in higher HDL cholesterol levels (Augustin et al., 2002).

Nevertheless, the evidence of LDL cholesterol and triglyceride lowering- effect in LGI diet is less conclusive. A number of studies have showed a positive change in LDL cholesterol following the LGI diet but the results did not reach its statistical significance (Kirpitch et al., 2011). The consumption of HGI meals may trigger postprandial insulin resistance resulting in an increase in NEFA, which may increase triglycerides and LDL cholesterol levels in the body (Augustin et al., 2002). Hence, the effect of GI on total cholesterol was more pronounced (Opperman et al., 2004). However, further research is needed to confirm the relationship.

The mean CRP, a physiological marker of inflammation with LGI diets has been reported to be lower than that with HGI diets (Wolever et al., 2008). This may be due to the exposure of endothelial cell to glucose fluctuation concentration after ingestion of HGI meals, rather than to the stable and constant concentration, increased oxidative stress and apoptosis (Risso et al., 2001). These increases will eventually trigger pro-inflammatory responses and greater release of CRP (Leiter et al., 2005).

REFERENCES

Abbassi-Ghanavati, M., Greer, L. G., Cunningham, F. G. (2009). Pregnancy and laboratory studies: a reference table for clinicians. *Obstetrics and Gynecology,* 114(6), 1326-1331.

Abbatecola, A. M., Rizzo, M. R., Barbieri, M., Grella, R., Arciello, A., Laieta, M., Acampora, R., Passariello, N., Cacciapuoti, F. & Paolisso, G. (2006).Postpranial plasma glucose excursions and cognitive functioning in aged type 2 diabetics. *Neurology,* 67 (2), 235-240.

Afaghi, A., Ghanei. & Ziaee, A. (2013). Effect of low glycemic load diet with and without wheat bran on glucose control in Gestational Diabetes Mellitus: A randomized trial. *Indian Journal of Endocrinology and Metabolism,* 17(4), 689-692.

American College of Obstetricians and gynecologists. (2011). Screening and diagnosis of gestational diabetes mellitus. Committee Opinion No. 504. *Obstetrics and Gynecology,* 118, 751-753

American Diabetes Association. (2003). Gestational Diabetes Mellitus. *Diabetes Care,* 26(1), S103-S105.

American Diabetes Association. (2004). Gestational diabetes mellitus. *Diabetes Care,* 27, s88-s90.

American Diabetes Association. (2007). Medical nutrition therapy and lifestyle intervention. *Diabetes Care,* 30 (Suppl. 2), s188-s193.

American Diabetes Association. (2008). Nutrition recommendation and interventions for diabetes: a position statement of the American Diabetes Association. *Diabetes Care,* 31, s61-78.

American diabetes association. (2014). Diagnosis and classification of diabetes mellitus. *Diabetes Care,* 37(1), s81-s90.

American diabetes association. (2015). Standard of medical care in diabetes. *Diabetes Care,* 38 (Suppl. 1), s1-s93.

Aminuddin, N. H. (2010). *Penentuan Indeks Glisemik Bagi Tiga Jenis Kuih Manis Tempatan* Tesis Sarjana Muda, Universiti Kebangsaan Malaysia.

Aston, L. M. (2006). Glycemic index and metabolic disease risk. *Proceeding of the Nutrition Society,* 65, 125-134.

Atkinson, F. S., Foster-Powell, K. & Brand-Miller, J. C. (2008). International tables of glycemic index and glycemic load values: 2008. *Diabetes Care,* 31, 2281- 2283.

Augustin, L. S., Franceschi, S., Jenkins, D. J. A., Kendall, C. W. C. & La Vecchia, C. (2002). Glycemic index in chronic disease: a review. *European Journal of Clinical Nutrition,* 56, 1049-1071.

Bansal, S., Buring, J. E. & Rifai, N. (2007). Fasting compared with nonfasting triglycerides and risk of cardiovascular events in women. *The Journal of American Medical Association,* 298, 309-316.

Barakatun Nisak M. Y., Firouzi, S., Shariff, Z. M., Mustafa, N., Ismail, N. A. M. & Kamaruddin, N. A. (2014). Weighing the evidence of low glycemic index dietary intervention for the management of gestational diabetes mellitus: an Asian perspective. *International Journal of Food Sciences and Nutrition,* 65(2), 144-150.

Barakatun Nisak M. Y., Ruzita, A. T., Norimah, K., Gilbertson, H. & Kamaruddin, N. A. (2010). Improvement of dietary Quality with the aid of low glycemic index diet in Asian patients with type 2 diabetes mellitus.*Journal* of *American College of Nutrition,* 29(3), 161-170.

Barakatun Nisak M. Y., Ruzita, A. T., Norimah, A. K., Azmi, N. K. & Fatimah, A. (2009). Acute effect of low and high gycemic index meals on post-prandial glycemia and insulin responses in patients with type2 diabetes mellitus.*Malaysian Journal of Medicine and Health Sciences,* 5(1), 11-20.

Barakatun Nisak M. Y., Talib, R. A. & Karim, N. A. (2005). Glycemic Index Of Eight Types Of Commercial Rice In Malaysia. *Malaysian Journal Of Nutrition,* 11, 151-163.

Barakatun Nisak M. Y., Talib, R. A., Karim, N. A., Kamarudin, N. A. & Arshad, F. (2008). The effect of low glycemic index bread eaten with different fillings on blood glucose response in healthy individuals. *Jurnal Sains Kesihatan Malaysia,* 6(1), 1-10.

Ben-Haroush, A., Yogev, Y., Chen, R., Rosenn, B., Hod, M. & Langer, O. (2004). The postprandial glucose profile in the diabetic pregnancy. *American Journal of Obstetric and Gynecology,* 191, 576-581.

Bergenstal, R. M. & Gavin, J. R. III. (2005). Global consensus conference on glucose monitoring panel. The role of self-monitoring of blood glucose in the care of people with diabetes: report of a global consensus conference. *American Journal of Medicine,* 118(9A), 1S-6S.

Bonet, B., Brunzell, J., Gown, A. & Knopp, R. (1992). Metabolism of very low density lipoprotein triglyceride by human placental: the role o flipoprotein lipase. *Metabolism,* 41, 596-603.

Bonora, E., Corrao, G. & Bagnardi, V. (2006). Prevalence and correlates of post-prandial hyperglycemia in a large sample of patient with type 2

diabetes mellitus. *Diabetologia,* 49, 846-854.

Brand-Miller, J., Wolever, T. M., Foster-Powell, K. & Colagluri, S. (2003). *The New Glucose Revolution.* Marlowe & Company: New York.

Brand-Miller, J., Hayne, S., Petocz, P. & Colagiuri, S. (2003). Low glycemic index diets in the management of diabetes: a meta-analysis of randomized controlled trials. *Diabetes Care,* 26, 2261-2267.

Buhling, K. J., Winkel, T., Wolf, C., Kurzidim, B., Mahmoudi, M., Wohlfarth, K., Wascher, C., Schink, T., Dudenhausen, J. W. (2005). Optimal timing for postprandial glucose measurement in pregnant population evaluated by the continuous glucose monitoring system (CGMS). *Journal of Perinatal Medicine,* 33(2),125-131.

Bukkapatnam, R. N., Berglund, L., Annurad, E., Devaraj, S., Hyson, D., Rafii, F., Malmstein, C., Villablanca, A. C. (2010). Postprandial metabolic responses to dietary glycemic index in hypercholesterolemic postmenopausal women. *Preventive Cardiology,* 13, 29-35.

Brand-Miller, J. Petocz, P., Hayne, S. & Colagiuri, S. (2003). Low glycemic index diets in the management of diabetes, a meta-analysis of randomized control trials. *Diabetes Care,* 26,2261-2267.

Brand-Miller, J. C., Stockmann, K., Atkinson, F., Petocz, P. & Denyer, G. (2009). Glycemic Index, postprandial glycemia, and the shape of the curve in healthy subjects: analysis of a database of more than 1000 foods. *The American Journal of Clinical Nutrition,* 89, 97-105.

Butte, N. F. (2000). Carbohydrate and lipid metabolism in pregnancy: Normal compared with gestational diabetes mellitus. *American Journal of Clinical Nutrition,* 71, 1256S-1261S.

California Division North Nutritional Services, (2007). Gestational Diabetes Diet 1800-2500 kcal.

Catalano, P. M., Tyzbir, E. D. & Wolfe, R. R.(1993) . Carbohydrate metabolism during pregnancy in control subjects and women with gestational diabetes. *American Journal of Physiology,* 264, E60-67.

Cavalot, F., Pagliarino, A. & Valle, M. (2011). Postprandial blood glucose predicts cardiovascular events and all-cause mortality in type 2 diabetes in a 14-year follow-up: lessons from the San Luigi Gonzaga Diabetes Study. *Diabetes Care,* 34, 2237–2243

Centers for disease control and prevention. National diabetic fact sheet: national estimates and general information on diabetes and prediabetes in The United States, (2011). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.

Ceysens, G., Rouiller, D. & Boulvain, M. (2006). Exercise for diabetic pregnant women. *The Cochrane Database of Systematic Review,* 19 (3), CD004225.

Chow, S. C. & Liu, J. P. (2014). Design and Analysis of Clinical Trials. Durham: Wiley.

Cummings, S., Hatley, W. & Simpson, E. (1982). The binding of high and low density lipoproteins to human placental membrane fractions. *The Journal of Clinical Endocrinology and Metabolism,* 54, 903-908

De Barros, M. C., Lopes, M. A, Francisco, R. P., Sapiemza, A. D. & Zugaib, M. (2010). Resistance exercise and glycemic control in women with gestational diabetes mellitus. *American Journal of Obstetrics and Gynecology,* 203(6), 556.e1-6.

de Veciana, M., Major, C. A., Morgan, M. A., Asrat, T., Toohey, J. S., Lien, J. M. & Evans, A. T. (1995). Post-prandial versus preprandial blood glucose monitoring in women with gestational diabetes mellitus requiring insulin therapy. *The New England Journal of Medicine,* 333, 1237-1241.

Devaraj, S., Venugopal, S. K., Singh, U. & Jialal I. (2005). Hyperglycemia induces monocytic release of interleukin-6 via induction of protein kinase c-α and -β. *Diabetes,* 54, 85-91.

Di Cianni, G., Miccoli, R., Volpe, L., Lencioni, C., Ghio, A., Giovannitti, M., Cuccuru, I., Pellegrini, G., Chatzianagnostou, K., Boldrini, A.,

Del Prato, S. (2005). Maternal triglyceride levels and newborn weight in pregnancy women with normal glucose tolerance. *Diabetes Medicine,* 22, 21-25.

Diane M. R. (2007). Medical nutrition therapy and lifestyle interventions. *Diabetes Care,* 30(Suppl. 2): s188-s193.

Duncan, J. M. (1882). On puerperal diabetes. *Trans Obstetrical Society of London,* 24, 256-285.

Ernst, G. D. S., Jonge, L. L. D., Hofman, A., Lindemans, J., Russcher, H., Steengers, E. A. P. & Jaddoe, V. W. V. (2011). C-reactive protein levels in early pregnancy, fetal growth patterns, and the risk for neonatal complications: the generation R Study. *American Journal of Obstetrics and Gynecology*, 205(2), 132.e1-132.e12.

Eugelgau, M. M., Herman, W. H., Smith, P. J., German, R. R. & Aubert, R. E. (1995). The epidemiology of diabetes and pregnancy in the US. *Diabetes Care,* 18, 1029-1033.

FAO. (1998). Carbohydrate in human nutrition. Report of a joint FAO/WHO expert consultation. *FAO Food Nutrition Paper,* 66, 1-140.

FAO. (2004). Rice is life. Retrieved from http://www.fao.org/newsroom/en/focus/2004 6887/ on 1st August 2015.

Farhanah, A. S., Fatin Nasirah, M. D., Barakatun Nisak, M. Y., Nor Azlin, M. I. & Zalilah, M. S. (2014). Current dietetic practices in the management of gestational diabetes mellitus: a survey of Malaysian dietitians. *Asian Journal of Clinical Nutrition,* 6(3), 67-74.

Ferrara, A. (2007). Increasing prevalence of gestational diabetes mellitus. A public health perspective. *Diabetes Care,* 30(Suppl 2), S141-s146.

Fong, K. S, . (2013) (Unpublished). The Glycemic Index of Mixed Meals. Disertation Bachelor of Food Science. School of Food Science and Nutrition, Universiti Malaysia Sabah.

Food and Nutrition Board, Institute of Medicine: U.S. (2002). Dietary reference intakes: Energy, carbohydrates, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, DC, national Academies Press.

Galgani, J., Aguirre, C. & Diaz, E. (2006). Acute effect of meal glycemic index and glycemic load on blood glucose and insulin responses in humans. *Nutrition Journal,* 5(22), 1-7.

Getahun, D., Fassett, M. J. & Jacobsen, S. J. (2010). Gestational diabetes: risk of recurrence in subsequent pregnancies. *American Journal of Obstetrics and Gynecology,* 203(5), 467.e1-6.

Gesina, D. S., E., Layla, L.D. J., Hofman, A., Lindemans, J., Russcher, H., Steegers, E.A.P. & Jaddoe, V. W. V. (2011). C-reactive protein levels in early pregnancy, fetal growth patterns, and the risk for neonatal complications: the generation R study. *American Journal of Obstetrics and Gynecology,* 205(132), e1-8.

Ginsberg, H. N. (2002). New perspective on antherogenesis: role of abnormal triglyceride- rich lipoprotien metabolism. *Circulation,* 106, 2137-2142.

Giugliano, D., Ceriello, A. & Esposito, K. (2008). Glucose metabolism and hyperglycemia. *American Journal of Clinical Nutrition,* 87, 217S-222S.

Gordon, D. J., Probstfild, j. I., Garrison, R. J., Neaton, J. D., Castelli, W. P., Knoke, J. D., Jacobs, J. D. R., Bangdiwala, S. & Tyroler, H. A. (1989). High- density lipoprotein cholesterol and cardiovascular disease. Four prospective American studies. *Circulation,* 79, 8-15.

Grant, S. M., Wolever, T. M. S., O' Connor, D.L., Nisenbaum, R. & Josse, R. G. (2011). Effect of a Low Glycemic Index Diet on Blood Glucose in Women with Gestational Hyperglycemia. *Diabetes Research and Clinical Practice,* 91,15-22.

Grgic, G., Skokic, F., Bogdanovic, G. (2010). C-reactive protein as a biochemical marker of idiopathic preterm delivery. *Medical Archives,* 64, 132-134.

Helibron, L., Noakes, M. & Clifton, P. M. (2002). The effect of high-and low-glycemic index energy restricted diets on plasma lipid and glucose profiles in type 2 diabetic subjects with varying glycemic control. *The Journal of American College of Nutrition,* 21, 120-127.

Henry, C. J., Lightowler, H. J., Kendall, F. L. & Storey, M. (2006). The impact of the addition of topping/fillings on the glycemic response to commonly consumed carbohydrate foods. *European Journal of Clinical Nutrition,* 60, 763-769.

Hawkins, J. S., Casey, B. M., Lo, J. Y., Moss, K., McIntire, D. D. & Leveno, K. J. (2009). Weekly compared with daily blood glucose monitoring in women with diet treated gestational diabetes. *Obstetric and Gynecology,* 113(6), 1307- 1312.

Henry, C. J., Lightowler, H. J., Kendall, F. L. & Storey, M. (2006). The impact of the addition of topping / fillings on the glycemic response to commonly consumed carbohydrate foods. *European Journal of Clinical Nutrition,* 60, 763-769.

Herrera, E. & Lasuncion, M. (2006). Maternal lipid metabolism and placental lipid transfer. *Hormone Research,* 65, 59-64.

Hishamuddin A, A. K. G., Easa A.M. (2005). Postprandial Plasma Glucos Response and Glyceamic Index of Different Form Of A Sago Meal *Conference of Nutrition Society Malaysia 2005.* Kuala Lumpur: Nutrition Society Malaysia

Hod, M. & Yogev, Y. (2007). Goals of metabolic management of gestational diabetes. *Diabetes Care,* 30 (Suppl 2), s180-187.

Horvath, K., Koch, K., Jeitler, K., Matyas, E., Bender, R., Bastian, H., Lange, S. & Siebenhofer, A. (2010) Effects of treatment in women with gestational diabetes mellitus: systematic review and meta-analysis. *British Medical Journal,* 340, 1-18.

Hunt, K. J. & Schuller, K. L. (2007). The increasing prevalence of diabetes in pregnancy. *Obstetrics and Gynecology Clinics of North America,* 34(2), 173-199

Hyperglycemia and adverse pregnancy outcomes. (2008). The HAPO study cooperative research group. *The New England Journal of Medicine,* 358(19), 1991-2002.

International Association of Diabetes and Pregnancy Study Groups Consensus Panel. (2010). International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care,* 33, 676-82

Jenkins, D. J. A., Jenkins, A. L., Wolever, T. M., Collier, G. R., Rao, A. V. & Thompson, L. U. (1987). Starchy food and fiber: reduced rate of digestion and improved carbohydrate metabolism. *Scandinavian Journal of Gastroenterology,* 129, 132-141.

Jenkins, D. J. A., C. W. C., Kendall, Eyssen, G. M., Josse, R G., Silverberg, J., Booth, G. L., Vidgen, E., Josse, A. R., Nguyen, T. H., Corrigan, S., Banach, M. S., Ares, S., Mitchell, S., Emam, A., Augustin, L. S. A., Parker, T. L., Leiter, L. A. (2008). Effect of a low glycemic index or high cereal fiber diet on type 2 diabetes: A randomized trial. *The Journal of the American Medical Association* 300(23), 2742-2753.

Kirpitch, A. R. & Maryniuk, M. D. (2011). The 3R's of glycemic index: recommendations, research, and the real world. *Clinical Diabetes,* 29(4), 155- 159.

Knopp, R. H., Chapman, M., Bergelin, R., Wahl, P. W., Warth, M. R. & Ivine, S. (1980). Relationship of lipoprotein to mild fasting hyperglycemia and diabetes in pregnancy. *Diabetes Care,* 3, 416-420.

Knopp, R. H., Magee, M. S., Raisys, V., Benetti, T. (1991). Metabolic effects of hypocaloric diets in management of gestational diabetes. *Diabetes,* 40(Suppl 2), 165-171.

Koukkou, E., Watts, G. F. & Lowy, C. (1996). Serum lipid, lipoprotein and apolipoprotein changes in gestational diabetes mellitus: a cross sectional and prospective study. *Journal of Clinical Pathology,* 49, 637-7.

Lain, K. Y. & Catalano, P. M. (2007). Metabolic changes in pregnancy. *Clinical Obstetrics and Gynecology* 50(4), 938-948.

Lam, C., Lim, K. H., Karumachi, S. A. (2005). Circulating angiogenic factors in the pathogenesis and prediction of preeclampsia. *Hypertension,* 46, 1077-1085.

Landon, M. B. & Gabbe, S. G. (2011). Gestational diabetes mellitus. *Obstetrics and Gynecology,* 118 (6), 1379-1393.

Langer, O. & Mazze, R. (1988). The relationship between large- for-gestational- age infants and glycemic control in women with gestational diabetes. *American Journal of Obstetric and Gynecology,* 159, 1478-1483.

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

Lee, J. E. 2015. Alternative biomarkers for assessing glycemic control in diabetes: fructosamine, glycated albumin, and 1,5-anhydrogluticol. *Annals of Pediatric Endocrinology and Metabolism,* 20, 74-78.

Lee, N. S. S. (2005). Determination Of Glyceamic Index In Three Types Of Dumplings With Red Bean, Lotus Seed And Curry Chicken In Local Market. *Conference Of Nutrition Soceity Malaysia 2005.* Kuala Lumpur.

Lee, S. A. N. S., S. (2005). Determination Of Glycemic Index Of Three Commercial Rice Varieties Eaten Together With Curr Y Chicken In Local Market. *Conference Of Nutrition Society Of Malaysia 2005.* Kuala Lumpur.

Leiter, L. A., Ceriello, A. & Davidson, J. A. (2005). Postprandial glucose regulation: new data and new applications. *Clinical Therapeutics,* 27(Suppl), s42-56.

Liu, A. G, Most, M. M., Brashear, M. M., Johnson, W. D., Cefalu, W. T. & Greenway, F. L. (2012). Reducing the glycemic index or carbohydrate content of mixed meals reduces postprandial glycemia and insulinemia over the entire day but does not affects satiety. *Diabetes Care,* 35, 1633-1637.

Louie J. C.Y., Miller, J. C.B. & Moses, R. G. (2012). Carbohydrates, glycemic index, and pregnancy outcomes in Gestational Diabetes. *Diabetes and Pregnancy.*

Louie, J. C., Markovic, T. P., Perera, N., Foote, D., Ross, G. P. & Brand- Miller, J. C. (2011). A randomized controlled trial I nvestigating the effects of a low glycemic index diet on pregnancy outcomes in gestational diabetes mellitus. *Diabetes Care,* 34(11), 2341-2346.

Louie, J. C. Y., Markovic, T. P., Ross, G. P., Foote, D. & Brand Miller, J. C. (2013). Timing of peak blood glucose after breakfast meals of different glycemic index in women with gestational diabetes. *Nutrients,* (5), 1-9.

Ludwig DS. (2002). The glycemic index. Physiological mechanisms relating to obesity, diabetes, and cardiovascular disease. *The Journal of the American Medical Association,* 287, 2414–23.

Magee, M.S., Knopp, R. H., Benedetti, T. J. (1990). Metabolic effects of 1200kcal diet in obese pregnant women with gestational diabetes. *Diabetes,* 39, 234-240.

Metzger, B. E., Buchanan, T. A., Coustan, D. R., Leiva, A. D., Dunger, D. B., Hadden, D. R., Hod, M., Kitzmiller, J. L., Kjos S. L., Oats, J. N., Pettitt, D. J., Sacks, D. A. & Zoupas, C. (2007). Summary and recommendations of the fifth international workshop-conference on gestational diabetes mellitus. *Diabetes Care,* 30 (2), s251-260.

Metzger, B. E. & Coustan, D. R. (1998). Proceedings of the fourth international workshop-conference on gestational diabetes mellitus. *Diabetes Care,* 21(suppl. 2), B1-B167.

Metzger, B.E. and Coustan, D.R. (1998). Summary and recommendations of the Fourth International Workshop-Conference on Gestational Diabetes Mellitus. The Organizing Committee. Diabetes Care, 21 (2), B161-7.

Metzger, B. E., Gabbe. & S. G., Persson. (2008). International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care,* 33, 676- 682.

Metzger, B. E., Lowe, L. P. & Dyer, A. R. (2008). Hyperglycemia and adverse pregnancy outcomes. *The New Journal of Medicine,* 358, 1991–2002

Mohd Yusof, B. N., Abd. Talib, R., Karim, N. A., Kamarudin, N. A. & Arshad, F. (2008). Glycemic Index Of Four Commercially Available Breads In Malaysia. *International Journal Of Food Sciences and Nutrition,* 60, 487- 496.

Moses, R. G., Barker, M., Winter, M., Petocz, P. & Brand-Miller, J. C. (2009). Can a low-glycemic index diet reduce the need for insulin in gestational diabetes mellitus? *Diabetes Care,* 32(6), 996-1000.

Nancy, F. B. (2000). Carbohydrate and lipid metabolism in pregnancy: normal compare with gestational diabetes mellitus. *American Journal of Clinical Nutrition,* 71(suppl), 1256S-1261S.

Negrato, C. A., Montenergo, R. M., Mattar, R., Zajdenverg, L., Francisco, R. P., Pereira, B. G., Sancovski, M., Torloni, M. R., Dib, S. A., Viggiano, C. E., Golbert, A., Moises, E. C., Favaro, M. I. ,Calderon, I. M., Fusaro, S., Pilikas, V. D., Dias, J. P., Gomes,

M. B. & Jovanovic, L. (2010). Dysglycemias in preganancy: from diagnosis to treatment. Brazilian consensus statement. *Diabetology and Metabolic Syndrome,* 2(27).

Ng, T. N. K. W. (2010). DietPLUS- a user-friendly ' 2 in 1' food composition database and calculator of nutrient intakes. *Malaysian Journal of Nutrition,* 16(1), 125-130.

Ngan, H., Barakatun Nisak, M. Y., Amin. I., Mohd Faez, H. B. & Jeevetha, S. (2012). Glycemic index values of selected commercialized rice in malaysia. current concerns and challenges in nutrition, 24-25 May 2012,Crowne Plaza Mutiara Hotel, Jalan Sultan Ismail, Kuala Lumpur. Nutrition Society Of Malaysia.

NICHD. (2004). Managing Gestational Diabetes. A patient's guide to a healthy pregnancy. NIH Publ. No. 04-2788, July 2004, National Institute of Child Health and Human Development, Bethesda, MD., USA., pp: 1-45. https://www.nichd.nih.gov/publications/pubs/gest_diabetes/Documents/m ana ging_gestational_diabetes.pdf.

Nik Shanita, S. (2005) (Unpublished). Pembangunan Dan Penentuan Indeks Glisemik Serta Jenis Karbohidrat Makanan Pilihan Atlet Ketahanan Tinggi. *Tesis Dr. Falsafah. Jabatan Pemakanan Dan Dietetik, Universiti Kebangsaan Malaysia*.

Nolan, C., Riley, S., Sheedy, M., Walstab, J. & Beischer, N. (1995). Maternal glucose tolerance, and neonatal birth weight ratio in pregnancy. *Diabetes Care,* 18, 1550-1556.

Nor Muaiza, A. N. S., S. (2005). Determination Of Glycemic Index Of White Bread With DifferentTypes Of Spreads. Youth & Nutrition, The Future Of The Nation, 2005 Kuala Lumpur. Nutrition Society.

Noor Aini, H., Maizuriati, A. R., Shamalla, D. K., Nur Amirah, Z. & Shahrul, A. S. (2012). Paper presented at the National Obstatrics Registry, Malysia. Abstract retrieved from http://www.acrm.org.my/nor/doc/poster/Diabetic_preg_poster.pdf

Norimah, A. K. & Kather, H. M. M. (2003). Nutritional status and food habits of middle- aged adults in selected areas of Selangor. *Malayian Journal of Nutrition,* 9(2), 125-136.

Norimah, A. K., Mohd Nasir, M. T., Hazizi, A. S., Suraya, I., Loh, S. H., Nurliyana, A. R. (2014). Association of body weight status and socio-demographic factors with food habits among preschool children in Peninsular Malaysia *Malayian Journal of Nutrition*, 20(3), 303-315.

Norimah, A.K., Safiah, M. Y., Jamal, K., Siti Haslinda, M.D., Zuhaida, H., Rohida, S., Fatimah, S., SitiNorazlin, Poh, B. K., Kandiah, M.,

Zalilah, M. S., Wan Manan, W. M., Fatimah, S. & Azmi, M. Y. (2008). Food consumption patterns: findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysian Journal of Nutrition,* 14(1), 25-39.

Nuttall, F. Q., Mooradian, A. D., Gannon, M. C., Billington, C. & Krezowski, P. (1984). Effect of protein ingestion on the glucose and insulin response to a standardized oral glucose load. *Diabetes Care,* 7, 465-470.

Opperman, A. M., Venter, C. S., Oosthuizen, W., Thompson, R. L., Vorster, H. H. (2004). Meta-analysis of the health effects of using the glycemic index in meal planning. *British Journal Nutrition,* 92, 367-381.

Pakbaz, S. (2011). *Acute Effect On Selected Four Common Beverages On Blood Glucose In Healthy Adult.* Master Thesis, Universiti Kebangsaan Malaysia.

Perera, O. P., Nakash, M. B., Covarrubias, A. P., Cano, A. R., Torres, A. R., Gonzalez, C. O., Ortega, F. V. (2009). A medical nutrition therapy program improves perinatal outcomes in Mexican pregnant women with gestational diabetes and type 2 diabetes mellitus. The Diabetes Educator, 35, 1004-1013.

Perera, O. P., Nakash, M. B., Rodriguez-Cano, A., Legorreta, J. L., Parra-Covarrubias, A. & Vadillo-Ortega, F. (2012). Low gycemic index carbohydrates versus all types of carbohydrates for treating diabetes in preganancy: A randomised clinical trial to evaluate the effect of glycemic control. *Internatinal Journal of Endocrinology* , 1-10.

Pitiphat, W., Gillman, M. W., Joshipura, K. J., Williams, P. L., Douglass, C. W. & Rich-Edwards, J. W. (2005). Plasma C-reactive protein in early pregnancy and preterm delivery. *American Journal of Epidemiology,* 162, 1108- 1113.

Ramel, A., Gudmundsdottir, F. D. & Thorsdottirs, I. (2012). Effects of two different types of fast food on postprandial metabolism in normal and overweight subjects. *European Journal of Clinical Nutrition,* 66(11), 1193-1198.

Ramlah, G. G., Al. Edwards, C. (2013). Glyceamic Index of A Rice And Chicken Curry Meal. *Promoting Better Nutrition For All.* Renaissance Hotel,Kuala Lumpur: Nutrition Society Malaysia.

Riccardi, G., Rivellese, A. & Giacco, R. (2008). Role of glycemic index and glycemic load in the healthy state, in prediabetes, and in diabetes. *American Society for Clinical Nutrition,* 87(1), 269S-274S.

Risso, A., Mercuri, F., Quagliaro, L., Damante, G. & Ceriello, A. (2005). Intermittet high glucose enhances apoptosis in human umbilical vein endothelial cell in culture. *American Journal of Physiology Endocrinology and Metabolism,* 281, E924-30.

Robert, S. D. & Ismail, A.-S. (2011). Glycemic Responses Of Patients With Type 2 Diabetes To Individual Carbohydrate-Rich Foods And Mixed Meals. *Annals of Nutrition And Metabolism,* 60, 27-32.

Robert, S. D., Ismail, A. A.-S., Winn, T. & Wolever, T. (2008). Glycemic Index Of Common Malaysian Fruits. *Asia Pacific Journal of Clinical Nutrition,* 17.

Rosalind, S. G. (2005). Principles of nutritional assessment. Second Edition. New York. Oxford University Press.

Sakuma, M., Okumura, H. Y. & Takeda, E. (2009). Dose-dependent effects of barley cooked with white rice on postprandial glucose and desacyl ghrelin levels. *Journal of Clinical Biochemistry and Nutrition,* 44(2), 151-159.

Sathyasurya, D. R., Ismail, A. A.-S., Nik, W. S. B. W. & Muda, W. M. W. (2006). Determination of the glycemic index of selected malaysian foods. *Journal Code, L4914a,* 13, 255-259.

Schaefer-Graf, U. M., Graf, K., Kulbacka, I., Kjos, S. L., Dudenhausen, J., Vetter, K. & Herrera, E. (2008). Maternal lipids as strong determinants of fetal environment and growth in pregnancies with gestational diabetes mellitus. *Diabetes Care,* 31(9), 1858-1863.

Schenk, S., Davidson, C. J., Zderic. T. W., Byerley, L. O. & Coyle, E. F. (2003). Different glycemic indexes of breakfast cereals are not due to glucose entry into blood but to glucose removal by tissue. *American Journal of Clinical Nutrition,* 78, 742-748.

Shyam, S., Arshad, F., Ghani, R. A., Wahab, N. A., Safii, N. S., Nisak, M. Y. B., Chinna, K. & Kamaruddin, N. A. (2013). Low glycemic index diets improve glucose tolerance and body weight in women with previous history of gestational diabetes: a six months randomized trial. *Nutrition Journal,* 12(68),1-12.

Silliman, K., Mahoney, J., Michels, V. & Miles, T. (2012). No apparent impact of meal glycemic index on postprandial lipid response in lean and abdominal obese women. *The Open Nutrition Journal,* 6, 97-103.

Sugiyama, M., Tang, A. C., Wakaki, Y. & Koyama, W. (2003). Glycemic index of single and mixed meal foods among common Japanese foods with white rice as a reference food. *European Journal of Clinical Nutrition,* 57, 743-752.

Sunnybrook Health Science Centre (2015). Diabetes education program. Retrieved from http://sunnybrook.ca/content/?page=sundec-diabetes-education

Suzana, S., Noor, A. M. Y., Nik Shanita, S., Rafidah, G. & Roslina, A. (2009). Atlas of Food Exchanges and Portion Sizes: MDC

Swami Vivekananda Youth Movement (2011). *addressing gestational diabetes mellitus: a reference manual.* (Publication No. 571121). Mysore District, Karnataka State, India.

Tuffnell, D. J., West, J. & Walkinshaw, S. A. (2003). Treatment for gestational diabetes and impaired glucose tolerance in pregnancy. 2003. *Cochrane Database System Review,* 3, CD003395.

Venn, B. J. and Green, T. J. (2007). Glycemic index and glycemic load: measurement issues and their effect on diet- disease relationships. *European Journal of Clinical Nutrition,* 61(suppl 1), S122-S131.

Wald. A., Van Thiel, D. H., Hoechstetter, L., Gavaler, J. S., Egler, K. M., Verm, R., Scott, L. & Lester, R. (1982). Effect of pregnancy on gastrointestinal transit. *Digestive. Diseases and Sciences,* 27, 1015-1018

Walker, J. D. (2008). NICE guidance on diabetes in pregnancy: management of diabetes and its complication from preconception to the postnatal period. NICE clinical guideline 63. *Diabetes Medicine,* 25(9), 1025-1027.

Wang, H. & Chow, S. C. (2007). Sample size calculation for comparing means. *Wiley Encyclopedia of Clinical Trials.*

Wang, X., Liang, L., Junfen, F. U. & Lizhong D. U. (2007). Metabolic syndrome in obese children born large for gestational age. *Indian Journal of Pediatrics*, 74, 561-5.

Wei, J. N., Li, H. Y. & Sung, F. C. (2007). Birth weight correlates differently with cardiovascular risk factors in youth. *Obesity*, 15, 1609-16.

WHO. (2011). Hemoglobin concentration for the diagnosis of anemia and assessment of severity. Vitamin and mineral nutrition information system. Geneva, World Health Organization. (http://www.who.int/vmnis/indicators/haemoglobin. pdf, accessed [16 June 2014]).

WHO/IOTF/IASO. (2000). The Asia-Pacific perspective: Redefining Obesity and its Treatment. Hong Kong: World Health Organization, International Obesity Task Force, International Association for the Study of Obesity.

Wolever, T. M. S. (2006). The glycemic index: a physiological classification of dietary carbohydrate. Oxfordshire, UK. CAB International.

Wolever, T. M. S., Gibbs, A. L., Mehling, C., Chiasson, J. L., Connelly, P. W., Josse, R. G., Leiter, L. A., Maheux, P., Lhoret, R. R., Rodger, N. W. & Ryan, E. A. (2008). The Canadian trial carbohydrates in diabetes (CCD), a 1-y controlled trial of low glycemic- index dietary carbohydrate in type 2 diabetes: no effect on glycated hemoglobin but reduction in C-reactive protein. *American Journal of Clinical Nutrition,* 87,114-25.

World Diabetes foundation, Global Alliance for Women's Health. (2009). Diabetes, Women, and Development: meeting summary, expert recommendations for policy action, conclusions, and follow-up actions. *International Journal of Gynecology and Obstetrics,* 104(1), 46-50.

World Heath Organization. (1999). Definition, diagnosis, and classification of diabetes mellitus and its complications. Part 1: Diagnosis and classification of Diabetes Mellitus.WHO/NCD/NCS/99.2ed.Geneva: World Health Organization