UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH GLYCEMIC STATUS AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN MERJAN DIABETIC CENTRE, IRAQ

ALI KADHIM ABBOOD AL HASNAWI

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By

ALI KADHIM ABBOOD AL HASNAWI

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

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DEDICATION

This thesis is especially dedicated to my family

my beloved mother “Fadila”, brothers, sisters and “my wife Noora Alsaedi and my lovely son Jaffer Alhasnawi”

For their great assistance and support for this research throughout the course of this study.

My uncle and aunt “Dr. Ali Alsaedi & Dr. Ibtisam Alzubadi”

For their endless support, encouragement and great inspiration all the way since the beginning of my research.

May Allah bless and protect them all.

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Chair : Assoc. Prof. Barakatun Nisak Mohd Yusof, PhD
Faculty : Medicine and Health Sciences

Type 2 diabetes mellitus (DM) is now posing the largest disease threat to Iraq's health care services with the majority of those patients was reported to have a poor glycemic status. Role of nutrition therapy is important; however, their nutritional status is not being fully addressed. Therefore, this cross sectional study aimed to determine nutritional status-related factors and their contribution to glycemic status in a sample of Iraqi patients.

Patients with T2 DM were recruited as a convenience sample from Merjan Diabetic Centre in Iraq, and participated in this study. Nutritional status characteristics namely anthropometric, biochemical, clinical and dietary intake data including calculated dietary Glycemic Index (GI) and Glycemic Load (GL) were collected. Glycemic status was assessed using the HbA1c level. Medical characteristic and other lifestyle behaviours, including smoking status and physical activity level were also obtained. Factors contributed to glycemic status were determined using multiple linear regression analyses.

A total of 170 diabetic patients (91 males, 79 females), aged 20 to 70 years (51.2 ± 10.2 years) were recruited with a response rate of 91%. In this study, mean HbA1c of the patients was 10.4 ± 1.6% with only 0.6% achieved the target treatment goal of HbA1c < 7%. About 45% and 44.2% of the subjects were overweight and obese respectively. Average daily energy intake of the patients was 2032.7 ± 274.6 kcal with the proportion of macronutrients were in line with the professional bodies' recommendation. There were seven factors namely; patients who were on diet alone (β= 0.25, t = 3.949, p = 0.0001); LDL level (β= -0.331, t = 5.388, p = 0.0001); dietary GL (β = 0.162 , t = 2.714, p = 0.007); physical activity level (β= -0.241 , t = -3.580, p = 0.0001); BMI (β= 0.214 , t = 3.395, p = 0.001); patients who were on Sulfonylurea (β = -0.167, t = -2.615, p = 0.01); total fiber (β = 0.133, t = -2.169, p = 0.032); were found to be the predictors which has been explained about 45% of the variation (R^2 = 0.45) in glycemic status.

In conclusion, the present study showed the significant contribution of diet alone, LDL level, Dietary GL, Physical activity, BMI, Sulfonylurea and total dietary fibre to glycemic status. Future studies should consider incorporating these components into the model to increase the effectiveness of any intervention to Iraqi type 2 DM.

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

FAKTOR PENYUMBANG KEPADA STATUS GLISEMIK DALAM KALANGAN PESAKIT DIABETES MELLITUS JENIS 2 DARI HOSPITAL PENGAJARAN TERPILIH DI IRAQ

Oleh

ALI KADHIM ABBOOD

Julai 2015

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

Diabetes Mellitus (DM) Jenis 2 kini dikenalpasti sebagai ancaman penyakit terbesar kepada perkhidmatan penjagaan kesihatan Iraq di mana kebanyakan pesakit dilaporkan mempunyai status glisemik yang teruk. Peranan terapi pemakanan adalah penting, walau bagaimanapun status pemakanan mereka tidak ditangani sepenuhnya. Oleh itu, kajian keratan rentas ini bertujuan menentukan faktor-faktor penyumbang kepada status glisemik dalam kalangan pesakit DM Jenis 2 dari Iraq.

Pesakit dengan T2 DM telah direkrut dengan persampelan mudah dari Pusat Diabetes Merjan di Iraq. Ciri-ciri status pemakanan iaitu data antropometri, biokimia, klinikal dan pengambilan diet termasuk pengiraan diet indeks glisemik (GI) dan muatan glisemik (GL) telah diperolehi. Status glisemik telah dinilai menggunakan aras HbA1c. Ciri-ciri perubatan dan tingkah laku gaya hidup yang lain termasuk status merokok dan tahap aktiviti fizikal juga dikumpul. Faktor penyumbang kepada status glisemik ditentukan menggunakan analisa regresi linear pelbagai.

Seramai 170 pesakit diabetes (91 lelaki, 79 perempuan) berumur 20 hingga 70 tahun (51.2 ± 10.2 tahun) telah direkrut dengan kadar respons penglibatan sebanyak 91%. Dalam kajian ini, min HbA1c pesakit adalah 10.4 ± 1.6% dengan hanya 0.6% yang telah mencapai matlamat sasaran rawatan HbA1c < 7 %. Hampir 45% dan 44.2% pesakit adalah masing-masing gemuk dan obes. Purata pengambilan tenaga setiap hari oleh pesakit adalah 2032.7 ± 274.6 kkal/hari dengan pembahagian makronutrien selari dengan cadangan profesional. Terdapat tujuh faktor iaitu; melalui nasihat diet sahaja (Beta=0.25, t = 3.949, p=0.0001); kolesterol LDL (Beta = -0.331, t = 5.388, p = 0.0001); GL diet (Beta = 0.162 , t = 2.714, p = 0.007); tahap aktiviti fizikal (Beta = -0.241 , t = -3.580, p = 0.0001); IJT (Beta = 0.214 , t= 3.395, p = 0.001); pesakit yang mengambil *Sulfonylurea* (Beta=-0.167, t = -2.615, p=0.01); jumlah fiber diet (Beta = 0.133, t = -2.169, p = 0.032); didapati merupakan peramal yang telah menjelaskan kira-kira 45 % daripada variasi (R^2 = 0.45) kepada status glisemik.

Kesimpulannya, kajian ini menunjukkan sumbangan secara signifikan nasihat diet sahaja, aras LDL, diet GL, aktiviti fizikal, BMI, Sulfonilurea, dan jumlah fiber diet kepada status glisemik. Kajian akan datang patut mempertimbangkan mengabungkan komponen ini dalam model bagi meningkatkan tahap keberkesanan sebarang intervensi kepada pesakit Iraq dengan DM jenis 2.

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I certify that a Thesis Examination Committee has met on 2 July 2015 to conduct the final examination of Ali Kadhim Abbood on his thesis entitled "Factors Associated with Glycemic Status among Type 2 Diabetes Mellitus Patients in Merjan Diabetic Centre, Iraq" 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 Master of Science.

Members of the Thesis Examination Committee were as follows:

Norhasmah binti Sulaiman, PhD
Senior Lecturer
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Chairman)

Hejar binti Abd. Rahman, PhD
Associate Professor
Faculty of Medicine and Health Science
Universiti Putra Malaysia
(Internal Examiner)

Hamid Jan bin Jan Mohamed, PhD
Associate Professor
Universiti Sains Malaysia
Malaysia
(External Examiner)

ZULKARNAIN ZAINAL, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 22 September 2015

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

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

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School of Graduate Studies
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I hereby confirm that:

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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Signature: _____

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LIST OF ABBREVIATIONS

ADA	American Diabetes Association
BMI	Body Mass Index
BMR	Basal Metabolic Rate
CVD	Cardiovascular Diseases
DBp	Diastolic Blood Pressure
GI	Glycemic index
GL	Glycemic load
HbA1c	Glycated Hemoglobin A1c
HDL-cholesterol	High-density lipoproteins- cholesterol
LDL-c	Low-density lipoproteins- cholesterol
MOH	Ministry of Health
NDGUAE	National Diabetes Guidelines UAE
OAD	Oral Anti-Diabetics Agents
RNI	Recommended Nutrients Intake
SBp	Systolic Blood Pressure
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
UKPDS	United Kingdom Prospective Diabetes Study
T2DM	Type 2 Diabetes Mellitus

CHAPTER 1

INTRODUCTION

1.1 Study Background

Type 2 Diabetes Mellitus (DM) is a public health problem, which has a substantial impact on morbidity and mortality. Type 2 DM, which affects about 90% of people with diabetes around the world, has been increasing worldwide, particularly in the Middle East (Badran & Laher, 2011). This trend is anticipated to take in a huge wage increase by 2030 (Farag1 & Gaballa2, 2010). In the Middle East, the prevalence of type 2 DM was 10.5% (Habibzadeh, 2012). Likewise, Iraq has not been spared from this challenging problem in as much as the International Diabetes Federation (2010) reported that the prevalence of type 2 DM in 2010 was 10.2%.

The current prevalence is expected to escalate in the near future in line with a drastic rise in obesity and corpulence among the Iraqi population (Alwan, 2011). This is because there is a close tie between the risk of the development of type 2 DM and the growing prevalence of obesity (Farag1 & Gaballa2, 2010). Approximately 90% of the patients who have developed type 2 DM were reported to be obese (Votey & Peters, 2007). Therefore, obesity in Iraq is a growing concern, and several studies have reported on this issue; the most recent one found that the prevalence of obesity among Iraqi men and women was 49% and 58%, respectively (World Health Organization, 2010).

Type 2 DM is characterized by chronic hyperglycaemia resulting from the body's ineffective use of insulin due to either defective insulin secretion, defective insulin action, or both (World Health Organization, 2013; Hamdy et al., 2008; Juraschek SP, June 2012). Poor glycemic status indicated by HbA1c > 7% is a major cause of diabetes-related complications including microvascular (diabetic nephropathy, neuropathy and retinopathy) and macrovascular (coronary artery disease, peripheral vascular disease and stroke) diseases (Cordova, 2011). Thus, these complications can considerably jeopardize the health of diabetic patients (Frank Hu, 2011; ADA, 2009; Schulze et al., 2004). It has caused significant physical and psychological morbidity, disability and premature mortality among those affected, and imposes financial burden on the health services.

Therefore, improving hyperglycaemia by optimizing the glycated haemoglobin A1c (HbA1c) may be a possible solution for delaying, or even preventing the onset of diabetic complications. One study have shown that each 1% reduction in mean HbA1c, has been associated with a reduction in risk of 21% for various diabetes-related complications (Jay H. Shubrook Jr, 2010).

Hence, glycosylated hemoglobin (HbA1c) index has become the gold standard for long-term monitoring glycemic control and is a validated measurement tool for assessing diabetes status. Therefore, the goal for glycemic control should be feasible to minimize risk for adverse events and reduce load of complications and cost on patients as well as improve glycemic control leading to a decrease in development and progression of vascular complications. On other hand, several studies suggest that there are many factors associated with poor glycemic control, such as low level of education,

higher BMI, hypercholesterolemia, hypertriglyceridemia, and elevated LDL-c (Al-Ibrahim et al., 2012; Farvid et al., 2014).

Another factors that found to be associated with glycemic status of type 2 diabetics were dietary glycemic index (GI) and dietary glycemic load (GL). GI is defined as a measure of carbohydrate quality, which classifies carbohydrate foods, based on their response to postprandial glycaemia (Wolever, 2006). GL is defined as a measure that combines carbohydrate quality and quantity in portion sizes (Wolever, 2006). An Iranian study has been conducted by Esfahani et al. (2009) demonstrated that low GI diets are effective in maintaining optimal glycemic control.

1.2 Problem Statement

Recently, Iraq has been suffering from constant war and conflict, which has had a consequential effect on the health of the Iraqi people. Accordingly, the health system in Iraq has experienced a decline as a result of the embargo and sanctions placed on the country following the Second Gulf War in 1991 (Al Hilfi et al., 2013).

Likewise, the war in 2003 has exacerbated the situation by destroying the infrastructure (Mansour, 2008). In contrast, many countries of Middle East that surrounding Iraq as Saudi Arabia and Iran were established stability and were able to improve their health systems. While the out-break in communicable disease continues, non-communicable chronic diseases, in particular, type 2 DM, now pose the largest disease threat to Iraq's health care services. Although poor glycemic status among Iraqi diabetics is highly prevalent, their nutritional status is not being fully addressed.

However, despite continuous management, this goal (HbA1c of less than 6.5 %) is not often met. Although the data reported in Iraq for the last 10 years have been insufficient, a few studies documented that the average HbA1c level has been recorded as 8.4%, which is higher than the recommended treatment goal. Indeed, only 24% of the patients achieved this target treatment goal (Mansour, 2008).

Another study was conducted in Jordan to determine the factors associated with glycemic control among 917 Jordanian patients with T2DM. Results showed that diabetes was more likely to be poorly controlled among those with increased duration of diabetes, low level of education, higher BMI, had hypercholesterolemia, had hypertriglyceridemia, and had elevated LDL-c. The results of that study suggested that 65.1% of patients had poor glycemic control defined as HbA1c > 7% (Al-Ibrahim et al., 2012).

While other cross sectional study which has been conducted among 1520 diabetic patients who attending King Khalid University Hospital (KKUH) in Riyadh, Saudi Arabia to evaluate glycemic control of diabetic patients, revealed that the overall glycemic control as evaluated by HbA1c was acceptable only in about 40% of the patients. However, many factors may account for this issue, and one of them was poor patient compliance with the treatment modalities. In addition to that were lifestyle modifications (Al-Rowais, 2014).

Most of the studies, which have been conducted in Merjan Hospital, focusing on many others medical related factors such as treatment modality, diabetes complications, diabetes duration and so forth (Al-Razzouqi et al, 2009). None of them have been

focusing on nutritional status, particularly dietary intake and calculated dietary GI/GL. This is important because the traditional diet of the Iraqi people is largely based on polished white rice and refined wheat, which has high GI and GL values (Al-Razzouqi et al, 2009).

Nevertheless, the information on dietary intake featured by a glycemic status among patients who have type 2 DM is inconsistent. The lack of data relevant to the dietary intake, nutritional status and their correlation with dietary GI/GL among Iraqi patients with type 2 DM shows the need for further research. Therefore, the current study is undertaken to address the problem and fill the gap.

1.3 Significance of the Study

Firstly, despite poor glycemic status among Iraqi diabetics is highly prevalent; their nutritional status is not being fully addressed. This study and its findings are conducted to fill the gap in the body of knowledge in the related area.

Secondly, the present study is set to provide an understanding about the contributing factors to glycemic status among Iraqi diabetic patients. The data collected can act as a baseline data which are collected to identify the issues that were contributed to glycemic status of Iraqi diabetic patients. The data can be used as references by doctors, diabetologists, nutritionists and other health care professionals in providing the best services and to identify the appropriate intervention of the targeted group in an effort to improve the overall diabetes outcome of the Iraqi diabetics. It can also be used by Iraqi Ministry of Health in developing an appropriate nutritional intervention, program and policy making to address specific needs of diabetics in Iraq.

1.4 Study Objective

This study aims to determine the factors associated with glycemic status among type 2 Diabetes Mellitus patients in Merjan Diabetes Centre, Iraq.

1.5 Specific Objectives

1. To determine the socio-demographic characteristics, medical characteristics, nutritional status (anthropometry, biochemical, clinical and dietary intake), dietary GI/GL, lifestyle behaviors (physical activity, smoking) of Iraqi patients with type 2 DM
2. To determine the glycemic status of Iraqi patients with type 2 DM
3. To determine the following relationship between:
   a. Socio-demographic factors and glycemic status.
   b. Medical characteristics and glycemic status
   c. Nutritional status (anthropometry, biochemical, clinical and dietary intake) and glycemic status.
   d. Dietary GI/GL and glycemic status
   e. Lifestyle behaviors and glycemic status

   of Iraqi patients with type 2 DM
4. To determine the contribution of socio-demographic factors, nutritional status factors, dietary GI/GL intake and lifestyle behaviors towards glycemic status of Iraqi patients with type 2 DM.

1.6 Null Hypothesis

1. There was no significant association between the following:
   a. Socio-demographic factors and glycemic status
   b. Nutritional status (anthropometry, biochemical, clinical and dietary intake) and glycemic status
   c. Calculated GI and GL, and glycemic status
   d. Lifestyle behaviours and glycemic status

   of Iraqi patients with type 2 DM
2. There was no significant contribution of socio-demographic factors, nutritional status factors, dietary GI/GL intake and lifestyle behaviours towards glycemic status of Iraqi patients with type 2 DM.

1.7 Conceptual Framework

Figure 1.1 shows the conceptual framework of the present study. The independent variables are socio-demographic characteristics (age, location, occupation, education level, ethnicity and income), medical background (characteristics and medical history, duration of diabetes treatment modalities and co-morbidities), Nutritional status (anthropometry, biochemical, clinical features, dietary intake), calculated dietary GI/GL and lifestyle behaviours (physical activity and smoking status). The dependent variable was glycemic status. The purpose of the present study was to determine the association between the independent and dependent variables among patients with type 2 DM in Merjan diabetic centre in Iraq. Besides, all the variables that are examined in this study, which determine four factors including SES, NS, GI/GL and physical activity, and their contribution to glycemic status (assessed by HbA1c).

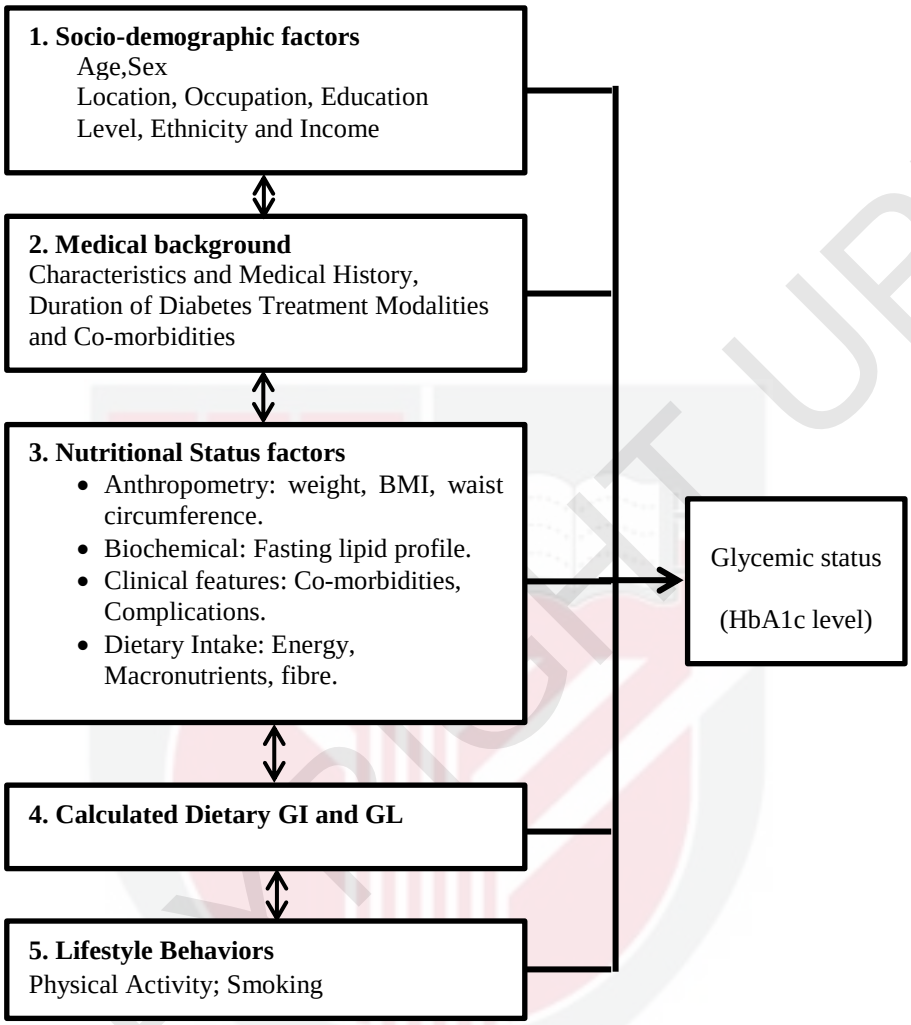

Figure 1.1. Conceptual framework of factors associated with glycemic status

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