PREDECTORS OF POOR GLYCEMIC CONTROL AMONG DIABETIC PATIENTS IN AL-MADINAH DIABETIC CENTRE, SAUDI ARABIA

MANSOUR A. ALMUTAIRI

FPSK(m) 2013 19
PREDICTORS OF POOR GLYCEMIC CONTROL AMONG DIABETIC PATIENTS IN AL-MADINAH DIABETIC CENTRE, SAUDI ARABIA

MANSOUR A. ALMUTAIRI

MASTER OF SCIENCE
UNIVERSITI PUTRA MALAYSIA
2013
PREDICTORS OF POOR GLYCEMIC CONTROL AMONG DIABETIC PATIENTS IN AL-MADINAH DIABETIC CENTRE, SAUDI ARABIA

By

MANSOUR A. ALMUTAIRI

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

July 2013
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

PREDICTORS OF POOR GLYCEMIC CONTROL AMONG DIABETIC PATIENTS IN AL-MADINAH DIABETIC CENTRE, SAUDI ARABIA

By

MANSOUR A. ALMUTAIRI

July 2013


Faculty: Medicine and Health Sciences

Poor glycemic control is a major public health problem. In Saudi Arabia, the incidence of poor glycemic control was high among patients with diabetes mellitus. Good glycemic control is a major objective for the prevention or postponement of long-term complications from diabetes. Marker of diabetes control is the glycosylated hemoglobin A1c (HbA1c). The American Diabetes Association (ADA) has designated an HbA1c level of <7% as a goal for optimal blood glucose control.

A cross sectional study was conducted to determine the predictors of poor glycemic control among ambulatory type 2 diabetes patients who were registered in the Al-Madinah Diabetic Centre, were at least 20 years of age, and had been diagnosed with diabetes for at least three months. A total of respondent were selected using systematic random sampling technique. The data were collected from 21st February 2010 to 21st
May 2010 using a self-administered, pre-tested questionnaire. The data on HbA1c level were collected from the patients’ files because all the diabetic patients must have their HbA1c level checked at interval regular visit, every three or, 6 months or yearly.

Poor glycemic control was defined as when HbA1c value is 7% or more for the past three month.

The response rate was 92%. Among the respondents, the overall percentage of poor glycemic control was 76%. The percentage of patients with poor glycemic control was highest among males, aged 60 years and older, who have no formal education, no job, low income, a positive family history of diabetes and those with oral hypoglycemic agent and respondents with one or more complications. In addition, these patients were diagnosed at age 40 years and above and had diabetes for 7 years and longer, with low levels of physical activity, obesity, and abnormal caloric intake. The glycemic control were significantly associated with family history of diabetes, duration of diabetes mellitus, type of diabetic management and number of diabetic complications $p<0.05$).

However, in the logistic regression analysis, the predictors of poor glycemic control were only positive family history of diabetes (OR=3.45, 95% CI: 1.29-9.18) and on oral hypoglycemic agents (OR=78.14, 95% CI: 8.88-687.69), and on insulin/combination treatment (OR=37.57, 95% CI: 4.07-346.55) than diet alone. This rather high proportion of poor glycemic control implies the need for the Diabetic Centre to make an effort to develop continuing educational programs that emphasize lifestyle modification and the importance of adherence to a treatment regimen for glycemic control among diabetic patients.

Keywords: Poor glycemic control, Diabetes Mellitus, Obesity, Physical activities, Diabetic Centre.
Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

RAMALAN KAWALAN GLISEMIK YANG KURANG BAIK DI KALANGAN PESAKIT DIABETIS DI PUSAT DIABETIS AL-MADINAH, ARAB SAUDI

Oleh

MANSOUR A. ALMUTAIRI

July 2013


Fakultu: Perubatan dan Sains Kesehatan

Teknik pensampelan rawak yang sistematik digunakan untuk memilih responden. Hasil kajian dikumpul dari 21 februari 2010 sehingga 21 mei 2010 melalui borang soal selidik urus sendiri yang telah diuji sebelumnya. Tahap HbA1c responden dikumpul daripada fail pesakit kerana setiap pesakit wajib mengambilnya ketika setiap lawatan berkala. Ketinggian responden diukur tanpa kasut menggunakan alat ukur tinggi badan dengan ketepatan 0.1 sentimeter (cm). Berat badan responden dengan pakaian ringan tanpa kasut diukur menggunakan alat timbang berat, dengan ketepatan 0.1 kilogram (kg). BMI mereka dikira menggunakan formula berat badan dibahagi oleh hasil darab dua kali ketinggian responden, dan/atau laporan kendiri melalui sosio-demografi, profil kesihatan, Aktiviti Soal Selidik Fizikal Antarabangsa serta teknik rekod ingatan diet 24 jam. Kadar tindak balas yang diperolehi asalah 92%. Berdasarkan jumlah tersebut, sebanyak 76% yang mempunyai kawalan glisemik yang kurang baik. Peratusan kawalan glisemik yang kurang baik paling tinggi adalah kalangan lelaki berumur 60 tahun dan ke atas, tiada pendidikan formal, tindak bekerja, berpendapatan rendah, mempunyai sejarah diabetis positif dalam keluarga, menjalani pengurusan Oral Combination (Oral & Diet), serta mempunyai satu atau lebih komplikasi. Begitu juga dengan responden berumur ke atas, jangka masa diabetis 7 tahun dan ke atas, kurang membuat aktiviti fizikal, mempunyai masalah obesiti, serta mengambil kandungan kalori yang banyak. Kawalan glisemik yang kurang baik di kait rapat dengan sejarah keluarga, jangka masa penyakit diabetis mellitus, pengurusan diabetis, dan komplikasi diabetis (p<0.05).

Walaubagaimanapun, dalam analis regrasi logistik, ramalan kawalan glisemik yang kurang baik hanya sejarah keluarga positif diabetis (OR=3.45, 95% SK: 1.29-9.18), dan oral rawatan glisemik (OR=78.14, SK: 4.07-346.55), dan gabungan rawatan (OR=37.57, 95% SK: 4.07-346.55) daripada diet semata-mata.

iv
Bahgian ini agak tinggi kerana kawalan glisemik yg kurang baik memerlukan Pusat Diabetes untuk membuat satu usaha mengabungkan program-program pendidikan berterusan daripada menentukan pengubahsuaian gaya hidup dan kepentingan atau pematuhan kepada regimen perubatan untuk kawalan glisemik dalam kalangan pesakit kencing manis.

Kata kunci: Kawalan glisemik yang kurang baik, Diabetes Melitus, Obesiti, Aktiviti fizikal, Pusat Diabetes.
ACKNOWLEDGEMENTS

I appreciate very much the help and guidance of my research supervisors, Dr. Salmiah Md. Said and co-supervisor, Dr. Huda Zainuddin who guided me during proposal consulting stage, data collection and analysis. Their advices and comments regarding my research project which had highly contributed to my improvement. Also, I wish to thank my wife and my parents for their continued patience and encouragement. Last but not least, my thanks go to my friends and colleagues for their provided me with continuous moral encouragements and guidance.
I certify that a Thesis Examination Committee has met on 18 July 2013 to conduct the final examination of Mansour Awad Almutairi on his thesis entitled "Predictors of poor glycemic control among diabetic patients in Al-Madinah Diabetic Centre, Saudi Arabia" in accordance with the Universities and the University College 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:

**Latiffah Binti A. Latiff, MBBS. MPH.**
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

**Hejar Binti Abdul Rahman, MD. M. Comm. Health**
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

**Anita Binti Abd. Rahman, MD. M. Comm. Health**
Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

**Noorlaili Mohd Tohit @ Mohd Tauhid, MD. MMED (Family Med.)**
Clinical Lecturer
Faculty of Medicine, Family Medicine
Universiti Kebangsaan Malaysia
(External Examiner)

**NORITAH OMAR, PhD**
Associate Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 31 July 2013
This thesis submitted to the senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory committee were as follows:

Medical Lecturer  
Department of Community Health  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Chairman)

**Huda Zainuddin, MD. M. Comm. Med.**
Medical Lecturer  
Department of Community Health  
Faculty of Medicine and Health Science  
Universiti Putra Malaysia  
(Member)

______________________________
BUJANG BIN KIM HUAT, PhD  
Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia
DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

----------------------------------
Mansour A. Almutairi
Date: 18 July 2013
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ABSTRACT</td>
<td>i</td>
</tr>
<tr>
<td></td>
<td>ABSTRAK</td>
<td>iv</td>
</tr>
<tr>
<td></td>
<td>ACKNOWLEDGEMENTS</td>
<td>vi</td>
</tr>
<tr>
<td></td>
<td>APPROVAL</td>
<td>viii</td>
</tr>
<tr>
<td></td>
<td>DECLARATION</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>LIST OF TABLES</td>
<td>xiv</td>
</tr>
<tr>
<td></td>
<td>LIST OF FIGURES</td>
<td>xv</td>
</tr>
<tr>
<td></td>
<td>LIST OF ABBREVIATIONS</td>
<td>xvi</td>
</tr>
<tr>
<td>Chapter</td>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1.2 Problem statement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1.3 Study Justification</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1.4 Study Objectives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.4.1 General objectives</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>1.4.2 Specific objectives</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>1.5 Research Hypothesis</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>1.6 Conceptual Framework</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>1.6.1 Dependent Variable</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>1.6.2 Independent Variable</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>LITERATURE REVIEW</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.1 Definition and Types of Diabetes Mellitus</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2.2 Diagnostic criteria</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>2.3 Epidemiology of Diabetes</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>2.4 Complication of Diabetes</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>2.5 Proportion of Poor glycemic control worldwide</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>2.6 Socio-demographic characteristics and glycemic control</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>2.7 Obesity and glycemic control</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>2.7.1 Definition of Obesity</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>2.7.2 Obesity in Saudi Arabia</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>2.7.3 Global Obesity</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2.7.4 Obesity and glycemic control</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>2.8 Physical activity and glycemic control</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>2.8.1 Definition of physical activity</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>2.8.2 Physical activity in Saudi Arabia</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2.8.3 Global physical activity</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>2.8.4 Physical activity and glycemic control</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>2.9 Diet in relation to glycemic control</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>2.10 Medical profile and glycemic control</td>
<td>30</td>
</tr>
</tbody>
</table>
3 METHODOLOGY
3.1 Study Location
3.2 Study Design
3.3 Data collection Duration
3.4 Study Population
  3.4.1 Inclusion Criteria
  3.4.2 Exclusion Criteria
  3.4.3 Sampling Frame
  3.4.4 Sampling Unit
  3.4.5 Sample Size
  3.4.6 Sample Method
3.5 Data Collection
  3.5.1 Study Instruments
  3.5.2 Data Collection Technique
3.6 Quality Control
3.7 Data Analysis
3.8 Study Ethics
3.9 Definition of Terms

4 RESULTS
4.1 Response Rate
4.2 Socio-demographic characteristics of the respondents
4.3 Medical profile of the respondents
4.4 Level of Physical Activities of the respondents
4.5 Calories intake of the respondents
4.6 Anthropometric measurements of the respondents
4.7 Glycemic Control of the respondents
4.8 Association between glycemic control and socio-demographic characteristics
4.9 Association between medical Profile, family history and glycemic control
4.10 Association between poor glycemic control and level of Physical Activities
4.11 Association between glycemic control and anthropometric Measurements
4.12 Association between glycemic control and dietary intake
4.13 Predictors of poor glycemic control

5 DISCUSSION
5.1 Response Rate
5.2 Proportion of poor glycemic control
5.3 Characteristic of respondents
  5.3.1 Association between glycemic control and Socio-demographic characteristics
  5.3.2 Association between glycemic control and obesity
  5.3.3 Association between glycemic control and physical activity
  5.3.4 Association between glycemic control and

xi
Dietary intake
5.3.5 Association between glycemic control and Medical Profile
5.4 Predictors of Poor glycemic control among type two diabetes

6 CONCLUSION AND RECOMMENDATION FOR FUTURE STUDIES
6.1 Summary and Conclusion 72
6.2 Limitation of the study 75
6.3 Recommendations for future studies 75

REFERENCES 77
APPENDICES 89