FACTORS INFLUENCING GLYCAEMIC CONTROL IN OLDER PEOPLE WITH TYPE 2 DIABETES MELLITUS ON ORAL HYPOGLYCAEMIC THERAPY AND ATTENDING A PRIMARY HEALTH CARE CENTRE IN NEGERI SEMBILAN, MALAYSIA

AKMAL NAZIAH BT. AHMAD

IG 2011 1
FACTORS INFLUENCING GLYCAEMIC CONTROL IN OLDER PEOPLE WITH TYPE 2 DIABETES MELLITUS ON ORAL HYPOGLYCAEMIC THERAPY AND ATTENDING A PRIMARY HEALTH CARE CENTRE IN NEGERI SEMBILAN, MALAYSIA

By

AKMAL NAZIAH BT. AHMAD

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

May 2011
DEDICATION

To my dearest parents,
Hj. Ahmad Hj. Shafie and Hjh Adziah Dato’ Hashim
For their true love, effort, guide and care since my childhood;
To my only sibling, Akmal Niza for her encouragement;
To my beloved husband, Mohammad Nazri
For all his understanding, patience and support during all the difficulties of my study
And;
To my dear children, Nasiruddin Manif and Nuruddin Harith
For always giving me joy during the hardship and making everything possible.
FACTORS INFLUENCING GLYCAEMIC CONTROL IN OLDER PEOPLE WITH TYPE 2 DIABETES MELLITUS ON ORAL HYPOGLYCAEMIC THERAPY AND ATTENDING A PRIMARY HEALTH CARE CENTRE IN NEGERI SEMBILAN, MALAYSIA

By

AKMAL NAZIAH BT AHMAD

May 2011

Chairman: Associate Professor Zaitun Yassin, PhD

Faculty: Institute of Gerontology

The number of Malaysian citizen living above 60 years is currently about 7% of the total population. The prevalence of diabetes in Malaysia has increased from 8.3% (1996) to 11% in 2006. Non-pharmacological factors were reported to play an important role in the progression of the disease. Factors like physical inactivity, dietary pattern and lifestyle practices such as alcohol consumptions and smoking habit among type 2 elderly diabetics were the variables that were studied in relation to glycaemic control. The aim of this research is to determine the prevalence of glycaemic control and factors associated with poor glycaemic control among elderly type 2 diabetic patients attending a primary health care in Negeri Sembilan.

Method: A cross-sectional study was conducted in July to October 2009 at a Primary Health Clinic in Port Dickson, Negeri Sembilan. A structured and pre-
tested interviewer administered questionnaire was used for data collection. The respondents were type 2 diabetic patients 60 years and above of age. After screenings for inclusion and exclusion criteria, 230 respondents were selected in the study. Statistical Package for Social Science (SPSS) version 18 was used for data analysis.

Results: The response rate was 78%. The results showed that the mean age was 68 ± 6 year and about 62% were less than 70 years. Majority of the respondents were female (56.5%), housewives (47.8%) and 60.4% have completed primary education. Sixty-one percent of the respondents had poor glycaemic control. A younger elderly ($x^2=6.701$, $p=0.010$), living arrangement ($x^2=7.604$, $p=0.006$), have non-home cook food ($x^2=3.869$, $p=0.049$) and have dinner without companion ($x^2=7.642$, $p=0.006$) show significant association. Additional to these, respondents on polytherapy ($x^2=21.593$, $p<0.001$), duration of diagnosis 5 to 10 years ($x^2=5.958$, $p=0.050$), age of first diagnosis less than 50 year ($x^2=12.113$, $p=0.002$) and uncontrolled serum triglyceride (Fishers exact test $p=0.049$) show significant association. Multiple logistic regression analysis resulted that Malay ethnicity (OR 2.5 95% CI 1.09-5.73), age of first diagnosis less than 50 year (OR 5.33 95% CI 1.27-22.33), age of first diagnosis 51-59 year (OR 4.07 95% CI 1.81-9.16), lunch without companion (OR 2.69 95% CI 1.25-5.82), daily lunch (OR 10.34 95% CI 2.02-53.9), polytherapy (OR 4.17 95% CI 1.95-8.90), difficulty in mobility (OR 2.12 95% CI 1.07-4.17) and amount of alcohol 2 glasses and more a week (OR 6.18 95% CI 1.84-20.77) were
significantly contribute to the risk of poor glycaemic control after adjusting for potential covariates.

**Conclusions:** Majority of the respondents had poor glycaemic control. Multiple lifestyle modifiable factors influenced the elderly type 2 diabetes. Therefore, there is a need to address these problems to the patients, their caregivers and the relevant party for an appropriate intervention to increase the awareness on self-management and healthy living.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

FAKTOR YANG MEMPENGARUHI KAWALAN GLYSEMIK DALAM KALANGAN WARGA EMAS BER PENYAKIT DIABETES MELLITUS JENIS 2 YANG MENERIMA TERAPI ORAL HYPOGLYSEMIK DI KLINIK KESIHATAN DI NEGERI SEMBILAN, MALAYSIA

Oleh

AKMAL NAZIAH BT AHMAD

Mei 2011

Pengerusi: Professor Madya Zaitun Yassin, PhD

Fakulti : Institut Gerontologi

Pada ketika ini, bilangan warganegara Malaysia yang telah mencapai umur 60 tahun dan ke atas adalah sebanyak 7 % dari keseluruhan populasi penduduk. Prevalens penyakit diabetes mellitus di Malaysia telah meningkat dari 8.3% (1996) kepada 11% dalam tahun 2006. Faktor rawatan bukan farmakologi dilaporkan memainkan peranan dalam perkembangan penyakit ini. Faktor seperti kurang aktiviti fizikal, corak pemakanan dan amalan gayahidup seperti pengambilan alkohol dan merokok dalam kalangan wargaemasa berpenyakit diabetes mellitus jenis 2 adalah pembolehubah yang dikaji bagi faktor yang mempengaruhi perkaitan dengan kawalan glysemik. Tujuan kajian ini adalah mengenalpasti prevalens glysemik yang tidak terkawal dan faktor yang menyebabkan glysemik tidak terkawal dalam kalangan wargaemasa berpenyakit
diabetes mellitus jenis 2 yang mendapatkan rawatan di klinik kesihatan di Negeri Sembilan.


Hasil Kajian: Kadar respon kajian ini adalah 78%. Purata umur responden adalah 68 ± 6 tahun dan seramai 62% responden berumur kurang dari 70 tahun. Kebanyakan responden adalah wanita (56.5%), surirumah (47.8%) dan 60.4% telah menamatkan pendidikan sehingga sekolah rendah. Enam puluh satu peratus dari responden mempunyai tahap glysemik yang tidak terkawal. Kumpulan yang berumur orang tua muda (x²=6.701, p=0.010), susunan tempat tinggal (x²=7.604, p=0.006), amalan mengambil makanan yang dibeli diluar rumah (x²=3.869, p=0.049) dan makan bersendirian semasa makan malam (x²=7.642, p=0.006) menunjukkan signifikan berkaitan dengan tahap glysaemik yang tidak terkawal. Tambah lagi, responden yang menggunakan gabungan rawatan oral terapi (x²=21.593, p<0.001), tempoh diagnos 5 hingga 10 tahun (x²=5.958, p=0.050), umur pada diagnosis pertama kali kurang dari 50 tahun
(x² = 12.113, p = 0.002) dan serum triglyserida yang tidak terkawal (Fishers exact test p = 0.049) menunjukkan signifikan berkaitan dengan tahap glysaemik yang tidak terkawal. Ujian analisis pelbagai menggunakan regrasi logistik binary menunjukkan kaum Melayu (nisbah mungkin (OR 2.5  95% CI 1.09-5.73), umur pada diagnosis pertama kali kurang dari 50 tahun (nisbah mungkin OR 5.33 95% CI 1.27-22.33), umur pada diagnosis pertama kali antara 51-59 tahun (nisbah mungkin OR 4.07 95% CI 1.81-9.16), makan bersendirian semasa makan tengahari (nisbah mungkin OR 2.69 95% CI 1.25-5.82), makan tengahari setiap hari (nisbah mungkin OR 10.34 95% CI 2.02-53.9), gabungan rawatan oral terapi (nisbah mungkin OR 4.17 95% CI 1.95-8.90), menghadapi masalah pergerakan (nisbah mungkin OR 2.12 95% CI 1.07-4.17) dan amalan meminum alkohol sebanyak 2 gelas dan lebih dalam seminggu (nisbah mungkin OR 6.18 95% CI 1.84-20.77) mempunyai signifikan berkaitan risiko glysemik yang tidak terkawal, setelah mengambilkira kovariat yang berpotensi.

ACKNOWLEDGEMENTS

I would like to take this opportunity to extend my gratitude to my supervisor, Assoc. Prof Dr. Zaitun Yassin, who has been very patient and understanding especially in guiding me and correcting my thesis. She has put in great effort in supervising my research work, advising me at all times and also a great mentor. My sincere thanks are extended to my co-supervisors Dr. Zaiton Ahmad and Dr. Salmiah Mohd. Said, for their guidance on data analysis and interpretation during the research work. The support given by members of the supervisory committee has given me strength to complete my thesis. I would like to thank Dr. Barakatunnisa Md Yusof, diettitian/ lecturer and Mr. Mohd Ashraf Harun in helping to analyse the dietary intake data.

I would also like to take this opportunity to thank the State Health Director of Negeri Sembilan and District Medical and Health Officer of Port Dickson for their co-operation and commitment. Not forgetting to the medical officers; Dr. Norashikin, Dr. Norafidah, Dr. Julina, non-communicable disease clinic team and patients of Port Dickson Health Clinic. My special thanks to Dr. Mariam Abd Manaf, Family Medicine Specialist for her invaluable co-operation that facilitate data collection within the stipulated time period.

I would like to thank all the staffs from Institute of Gerontology and Faculty of Medical and Health Sciences, UPM for their technical help and finally to ALLAH the Almighty for making this study possible.
I certify that a Thesis Examination Committee has met on 18th May 2011 to conduct the final examination of Akmal Naziah bt. Ahmad on her thesis entitled “Factors Influencing Glycaemic Control In Older People with Type 2 Diabetes Mellitus on Oral Hypoglycaemic Therapy And Attending A Primary Health Care Centre in Negeri Sembilan, Malaysia” 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 Science in Gerontology.

Members of the Thesis Examination Committee were as follows:

Loke Seng Cheong, MBBS, MRCP, FAMS  
Senior Lecturer  
Institute of Gerontology  
Universiti Putra Malaysia  
(Chairman)

Hejar Abd. Rahman, MD, M.Community Health  
Associate Professor  
Faculty of Medical and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

Chan Yoke Mun, PhD  
Senior Lecturer  
Department of Nutrition and Dietetic  
Universiti Putra Malaysia  
(Internal Examiner)

Norlaila Mustafa, MD, MMed,MD  
Associate Professor  
Medical Department, HUKM  
Universiti Kebangsaan Malaysia  
Malaysia  
(External Examiner)

NORITAH OMAR, PhD  
Associate Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia
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 in Gerontology. The members of the Supervisory Committee were as follows:

**Zaitun Yassin, PhD**  
Associate Professor  
Faculty of Medical and Health Science  
Universiti Putra Malaysia  
(Chairman)

**Zaiton Ahmad, MD, MFam.Med**  
Faculty of Medical and Health Science  
Universiti Putra Malaysia  
(Member)

**Salmiah Md Said, MD, MPH**  
Faculty of Medical and Health Science  
Universiti Putra Malaysia  
(Member)

---

**HASANAH MOHD. GHAZALI, PhD**  
Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date:
DECLARATION

I declare that the thesis is my original work 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 other institutions.

AKMAL NAZIAH BT AHMAD

Date: 18 May 2011
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ix</td>
</tr>
<tr>
<td>APPROVAL SHEETS</td>
<td>x</td>
</tr>
<tr>
<td>DECLARATION FORMS</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xvii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xix</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xx</td>
</tr>
</tbody>
</table>

## CHAPTER

### 1 INTRODUCTION

1.1 Statement of problems               5
1.2 Significance of the study           7
1.3 Objectives
   1.3.1 General objectives             8
   1.3.2 Specific objectives            8
1.4 Hypotheses                          9
1.5 Conceptual framework                10

### 2 LITERATURE REVIEW

2.1 Introduction                         14
   2.1.1 Definition of Diabetes          16
   2.1.2 Pathophysiology of Diabetes     16
2.2 Severity of diabetes                 17
2.3 Ageing and diabetes                  19
2.4 Medical profiles                     19
   2.4.1 Glycosylated Hemoglobin         19
   2.4.2 Type of therapy in diabetes     20
   2.4.3 Problems in adherence to therapy 22
   2.4.4 Polypharmacy in elderly diabetic 22
   2.4.5 Presence of other chronic diseases 23
   2.4.6 Biochemical profiles           24
2.5 Anthropometric variables             25
   2.5.1 Body mass index                 25
   2.5.2 Waist circumference             27
   2.5.3 Calf circumference              28
2.6 Eating pattern and dietary intake     29
   2.6.1 Vegetables and fibres           29
   2.6.3 Meals frequency                 30
   2.6.4 Healthy diet, lifestyle and psychosocial wellbeing 30
   2.6.5 Macronutrient                   31
2.7 Physical activity
   2.7.1 The effectiveness of exercise 32
   2.7.2 Role of physical activity on insulin sensitivity
       and other chronic diseases 33
2.8 Smoking habit
   2.8.1 Smoking and its effect on diabetic complications 35
   2.8.2 Cessation of smoking in diabetes 36
2.9 Alcohol consumption
   2.9.1 Alcohol and diabetes 37
   2.9.2 Amount of alcohol consumption in diabetes 37

3 METHODOLOGY 39
3.1 Study location 39
3.2 Sampling 40
3.3 Sample size 41
3.4 Recruitment of respondents 42
3.5 Variables 43
   3.5.1 Dependent variable 43
   3.5.2 Independent variable 44
3.6 Data Collection 44
   3.6.1 Food Frequency Questionnaire 45
3.7 International Physical Activity Questionnaire (IPAQ) 45
   3.7.1 Coding of Physical Activity According to IPAQ Category 46
3.8 Biochemical Profiles 48
3.9 Measurements 51
   3.9.1 Blood pressure measurements 51
   3.9.2 Anthropometric measurements 52
      3.9.2.1 Weight and height 52
      3.9.2.2 Waist circumference 52
      3.9.2.3 Calf circumference 53
3.10 Calculation of Body Mass index 53
3.11 Pretest 54
3.12 Data analysis 54
   3.12.1 Data Analysis of Dietary Intake 55
3.13 Ethical Consideration 56
3.14 Operational definition 56

4 RESULTS 60
4.1 Introduction 60
4.2 Socio demographic background 61
4.3 Medical profiles 61
4.4 Blood pressure 66
4.5 Anthropometric measurements 66
4.6 Biochemical profiles 68

xiv
4.6.1 Glycosylated hemoglobin, fasting lipid profile and fasting blood sugar of the respondents
4.6.2 Liver function test of respondents
4.6.3 Renal profiles of the respondents
4.7 Dietary pattern
4.7.1 Meal frequencies
4.7.2 Energy and macronutrient intake
4.8 Physical activity
4.9 Lifestyle factors
4.10 Prevalence of poor glycaemic control
4.11 Association between glycaemic control with socio demographic characteristics
4.12 Association between glycaemic control with medical profiles
4.12.1 Association between glycaemic control with treatment history
4.12.2 Association between glycaemic control with blood pressure
4.12.3 Association between glycaemic control with anthropometric characteristics
4.12.4 Association between glycaemic control with biochemical profiles
4.12.4.1 Fasting lipid profiles
4.12.4.2 Fasting blood sugar and liver function test
4.12.4.3 Renal profile
4.13 Association between glycaemic control and dietary pattern
4.13.1 Association between glycaemic control and macronutrient intake
4.14 Association between glycaemic control and physical activity
4.15 Association between glycaemic control and lifestyle factors
4.16 Predictors of poor glycaemic control

5 DISCUSSIONS
5.1 Introduction
5.2 Socio demographic factor
5.3 Medical profiles
5.4 Anthropometric factors
5.5 Dietary factors
5.6 Physical Activity
5.7 Smoking habit
5.8 Alcohol consumption
<table>
<thead>
<tr>
<th>6</th>
<th>CONCLUSIONS AND RECOMMENDATIONS</th>
<th>109</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Conclusions</td>
<td>109</td>
</tr>
<tr>
<td>6.2</td>
<td>Recommendations</td>
<td>110</td>
</tr>
<tr>
<td>6.3</td>
<td>Study Limitations</td>
<td>111</td>
</tr>
</tbody>
</table>

REFERENCES  
APPENDICES  
BIODATA OF STUDENT  

xvi