UNIVERSITI PUTRA MALAYSIA

APPLICATION OF A SOCIAL COGNITIVE THEORY MODEL TO ANALYSE HYPOGLYCAEMIC RISK FACTORS IN OLDER PATIENTS WITH TYPE 2 DIABETES IN TWO RURAL PRIMARY HEALTHCARE CLINICS IN SELANGOR, MALAYSIA

OOI CHEOW PENG

IG 2011 4
APPLICATION OF A SOCIAL COGNITIVE THEORY MODEL TO ANALYSE HYPOGLYCAEMIC RISK FACTORS IN OLDER PATIENTS WITH TYPE 2 DIABETES IN TWO RURAL PRIMARY HEALTHCARE CLINICS IN SELANGOR, MALAYSIA

OOI CHEOW PENG

DOCTOR OF PHILOSOPHY
UNIVERSITI PUTRA MALAYSIA

2010
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

APPLICATION OF A SOCIAL COGNITIVE THEORY MODEL TO ANALYSE HYPOGLYCAEMIC RISK FACTORS IN OLDER PATIENTS WITH TYPE 2 DIABETES IN TWO RURAL PRIMARY HEALTHCARE CLINICS IN SELANGOR, MALAYSIA

By

Ooi Cheow Peng

2010

Chair: Associate Professor Tengku Aizan Tengku Abdul Hamid, PhD
Institute: Institute of Gerontology

The confluence of the ageing population and rise in prevalence of Type 2 Diabetes Mellitus (T2DM) among the younger adults will lead to an epidemic in the older adults. These older adults with T2DM are vulnerable to hypoglycaemia, and they suffer significantly from its adverse consequences.

The main objective of this study is to determine the specific putative modifiable factors that can significantly contribute to the hypoglycaemic risk amongst older people with T2DM, within two rural primary care clinics in Selangor, Malaysia. Social Cognitive Theory (SCT) is used to guide the translation of the modifiable risk factors of hypoglycaemia into the perspective useful for clinical practice. The hypotheses of the significant relationship between the putative risk factors as well as the determination of putative modifiable risk factors on the proportion of hypoglycaemia in the sample of older patients with T2DM were tested.
A cross-sectional study was carried out amongst 170 young-old adults with T2DM. Consecutive patients who fulfilled both the inclusion and exclusion criteria were invited. Informed consent was sought prior to interview. Structured questionnaires consisting of a checklist of 20 self-reported symptoms of hypoglycaemia, awareness, fear and prevention of hypoglycaemia were used. Information from medical records was also used to compile the information required for the ‘Mini-Nutritional Assessment – short-form’ and for quantifying the level of social engagement. Binary logistic regression analyses were used to analyse the data.

The results revealed that these respondents had high social engagement, suboptimal glycaemic control, high proportion of mild hypoglycaemia, cardiovascular risk and risk factors for disability. Four modifiable risk factors significantly contributed to the hypoglycaemia in the respondents, namely; microvascular complications of T2DM, awareness of hypoglycaemia, nutritional risk and a lower level of social engagement. The significant association of the fear of hypoglycaemia with hypoglycaemia, and the suppression of the level of social engagement in the hierarchical logistic regression model, implies all constructs of the SCT (personal, social and psychological domains) are required to explain the inter-relationships of the risk factors in hypoglycaemia. This has not been shown in previous studies.

The respondents are at risk for disability but not disabled. Thus, there are windows of opportunity to target potential interventions that extend beyond glycaemia control, to the maintenance of functional status, participation in social life and the
prevention of disabilities. These potential interventions include developing education and management programs, emphasising hypoglycaemia in the care of older diabetics. Extending the understanding of mechanisms of the inter-relationships of biological, medical, psychological and social domains, including the contributions of social support, is also important. Externally validating these risk factors of hypoglycaemia on a different set of older adults with T2DM will facilitate the development of a clinical support tool.
Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah.

PENGUNAAN SATU MODEL TEORI KOGNITIF SOSIAL UNTUK MENGANALISIS FAKTOR RISIKO HYPOGLYCAEMIC DALAM PESAKIT WARGA TUA DIABETES MELLITUS JENIS 2 DI DUA KLINIK KESIHATAN PRIMER LUAR BANDAR DI SELANGOR, MALAYSIA

Oleh

Ooi Cheow Peng

2010

Pengerusi: Profesor Madya Tengku Aizan Tengku Abdul Hamid, PhD
Institute: Instittut Gerontologi

Pertembungan diantara pertumbuhan pesat bilangan penduduk tua dan pertingkatan prevalens penyakit Diabetes Mellitus (DM) Jenis 2 dalam kalangan orang dewasa akan menyebabkan epidemik penyakit ini dalam kalangan warga tua. Warga tua pesakit DM Jenis 2 mudah terdedah kepada hipoglisisemia serta kesan buruk akibat hipoglisisema.

Objektif utama kajian ini ialah untuk menentukan faktor boleh diubah khusus yang menyumbang kepada risiko hipoglisisemia dalam kalangan warga tua pesakit DM Jenis 2 dari dua klinik rawatan primer luar bandar di Selangor, Malaysia. Teori kognitif sosial (SCT) digunakan sebagai panduan untuk menterjemahkan faktor risiko bolehubah hipoglisisemia kepada perspektif berguna untuk amalan klinikal.
Hipotesis hubungan signifikan antara faktor risiko bolehubah serta penentuan faktor risiko bolehubah hipoglisemia ke atas kadar hipoglisemia dalam sampel kalangan warga tua pesakit DM Jenis 2 diuji.


Hasil kajian ini menunjukkan responden mempunyai tahap penglibatan sosial tinggi, pengawalan glukosa dalam darah suboptimal, tinggi kadar hipoglesemia sederhana, tinggi risiko mendapat penyakit kardiovaskular dan kekidakupayaan. Empat faktor risiko bolehubah didapati menyumbang kepada hipoglisemia responden, iaitu komplikasi mikrovaskular DM Jenis 2, kesedaran hipoglisemia, risiko pemakanan dan penglibatan sosial yang rendah. Hubungan signifikan perasaan takut terhadap hipoglisemia dengan hipoglisemia, penumpasan tahap penglibatan sosial dalam model regresi logistik hierarki menunjukkan semua konsep dalam SCT (domain
peribadi, sosial dan psikologi) diperlukan untuk menerangkan hubungkait faktor risiko hipoglisemia. Ini tidak pernah ditunjukkan dalam kajian lepas.

ACKNOWLEDGEMENTS

I wish to express my utmost gratitude and appreciation to Associate Professor Dr Tengku Aizan Tengku Abdul Hamid, the chairperson of the supervising committee, for her patience, kind understanding, unfailing guidance and help in facilitating this study program, research, and completion of my thesis. I also wish to express my gratitude and deepest thanks to the members of the supervising committee, Dr Loke Seng Cheong, Assoc. Prof. Dr. Zaitun Yassin and Dr Zaiton Ahmad for their invaluable support and guidance throughout this study program and completion of this thesis.

I would also like to acknowledge the support provided by the Research University Grant of Universiti Putra Malaysia for conducting this research project in Poliklinik Kommuniti Sg Pelek and Poliklinik Kommuniti Dengkil. I am deeply grateful to the Ministry of Health, Malaysia for granting the approval to conduct this research in their facilities. Special thanks to all the doctors and staff in these clinics who were of great help during the study. I would also like to extend my sincere appreciation to all the subjects of this study for their co-operation and willingness to participate in the study.

Finally, I am very grateful to my mother, for her continued moral support, encouragement and belief in me as I engaged in this study program and research. I am also indebted to all those I may have neglected to mention here. Please accept my apologies.
I certify that a Thesis Examination Committee has met on 23 November 2010 to conduct the final examination of Ooi Cheow Peng on her thesis entitled “Application of a Social Cognitive Theory Model to Analyze Hypoglycemia Risk Factors in Older Patients with Type 2 Diabetes in Two Rural Primary Healthcare Clinics in Selangor, Malaysia” in accordance with the Universities and 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 Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

**Rahimah binti Ibrahim, PhD**
Lecturer
Faculty of Human Ecology
Universiti Putra Malaysia
(Chairman)

**Chan Yoke Mun, PhD**
Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

**Wong Teck Wee, PhD**
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

**Melvin Leow Khee Shing, PhD**
Lecturer
Brenner Centre for Molecular Medicine
Singapore
(External Examiner)

---

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

Date: 22 February 2011
This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follow:

Tengku Aizan Tengku Abdul Hamid, PhD
Associate Professor
Institute Gerontology
Universiti Putra Malaysia
(Chairman)

Zaitun Yassin, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Zaiton Ahmad, MMed
Senior Lecturer (Family Medicine)
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Loke Seng Cheong, FAMS (Endocrinology)
Senior Lecturer
Institute Gerontology
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 at any other institution.

OOI CHEOW PENG

Date: 12th January 2011
# TABLE OF CONTENTS

| ABSTRACT | i |
| ABSTRAK | iv |
| ACKNOWLEDGEMENTS | vii |
| APPROVAL | viii |
| DECLARATION | x |
| LIST OF TABLES | xiv |
| LIST OF FIGURES | xvi |

## CHAPTER

### 1 INTRODUCTION

1.1 Background and context of the study 1
1.2 Problem statement 5
1.3 Significance of the study 9
1.4 Research questions 12
1.5 Research objectives 13
1.6 Research hypotheses 13
1.7 Conceptual framework 14
1.8 Assumptions 16
1.9 Limitations of the study 17

### 2 LITERATURE REVIEW

2.1 Background of hypoglycaemia in older adults with T2DM 19
2.2 Issues of research of hypoglycaemia in older adults with T2DM 22

#### 2.2.1 Defining hypoglycaemia 22
#### 2.2.2 Measurement of symptoms of hypoglycaemia 24

2.3 Prevalence and risk factors of hypoglycaemia in older adults with T2DM 27

#### 2.3.1 Prevalence of hypoglycaemia in older adults with T2DM 27
#### 2.3.2 Risk factors of hypoglycaemia in older adults 28

2.4 The impact of hypoglycaemia in the older T2DM 41

#### 2.4.1 Clinical impact 41
#### 2.4.2 Behavioural responses to hypoglycaemia 43
#### 2.4.3 Impact on functions 45
#### 2.4.4 Impact on social environment 48

2.5 Theoretical orientation of the study based on Bandura’s SCT 50

#### 2.5.1 Background 50
#### 2.5.2 Theoretical framework guiding the study of risk factors of hypoglycaemia of the older adults with T2DM 55

2.6 Summary of chapter 58
## CHAPTER 3 METHODOLOGY

3.1 Research design 60
3.2 Research sample and sampling procedure 62
3.3 Sample size 65
3.4 Description of data collection areas 66
3.5 Measurement and instrumentation
   3.5.1 Dependent variable: self-reported hypoglycaemia 69
   3.5.2 Independent variables 72
3.6 Pilot study 85
3.7 Data collection 87
3.8 Data analysis
   3.8.1 Exploratory data analysis 90
   3.8.2 Statistical analyses 91
3.9 Chapter summary 94

## CHAPTER 4 RESULTS AND DISCUSSIONS

4.1 Profile of the older adults with T2DM
   4.1.1 Personal characteristics 99
   4.1.2 Socio-environmental factors 113
   4.1.3 Risk factors for disability in older adults with T2DM 115
   4.1.4 Behavioural responses to hypoglycaemia 116
   4.1.5 Glycaemic control of the older T2DM 117
4.2 Proportion of hypoglycaemia in this sample of older patients with T2DM 124
4.3 Risk factors of hypoglycaemia in the older adults with T2DM
   4.3.1 Logistic regression analyses 126
   4.3.2 Interpretation of the binary logistic regression analyses 134
   4.3.3 Assessment of reproducibility of dataset in deriving risk factors of hypoglycaemia in older adults with 2DM in clinical setting 144
4.4 Effect of behavioural responses to hypoglycaemia factors on the relationship of personal factors and socio-environmental factors on hypoglycaemia
   4.4.1 Hierarchical logistic regression results for socio-environmental factors and personal factors combined with behavioural responses to hypoglycaemia factors 149
   4.4.2 Discussions of findings 152
CHAPTER 5  SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

5.2 Implications
   5.2.1 Implications for theory
   5.2.2 Implications for clinical practice
   5.2.3 Implications for public health

5.3 Recommendations
   5.3.1 Theory
   5.3.2 Clinical practice
   5.3.3 Public health

References

Appendices
   Appendix 1
   Appendix 2
   Appendix 3
   Appendix 4
   Appendix 5
   Appendix 6
   Appendix 7

Biodata of Student

Publications