UNIVERSITI PUTRA MALAYSIA

PREDICTORS OF SELF-CARE BEHAVIOUR USING HEALTH BELIEF MODEL AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN A DISTRICT OF PENANG, MALAYSIA

KANG CHIA YEE

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By

KANG CHIA YEE

Dissertation Submitted to the Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Public Health

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Chairman: Dr. Salmiah Md Said
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Background: The prevalence of diabetes mellitus among Malaysian aged ≥ 18 years increasing from 11.6% in 2006 to 17.5% in 2015. The diabetes prevalence in Penang state was 18.1% in 2015. Only 21% of audited type 2 diabetes mellitus (T2DM) patients in Penang achieved hemoglobin A1c < 6.5% in 2012. Positive self –care behaviour leads to good glycaemic control and reduce risk of diabetes complications.

Objective: The objective of this study is to determine the diabetes self-care behaviour and its predictors using Health Belief Model (HBM) among T2DM patients in government health clinics at Seberang Perai Selatan district, Penang.

Methodology: An analytical cross sectional study was conducted on 546 T2DM patients whose aged ⩾18 years, they were recruited by simple random sampling method. Validated self-administered questionnaire was used, data were analysed using SPSS version 22.0.

Results: The respondents practised 3.4 (SD = 1.11) days diabetes self-care behaviour for the past 1 week. The predictors of self-care behaviour were self-efficacy (standardized $\beta = 0.257$, $p < 0.001$), knowledge (standardized $\beta = 0.112$, $p = 0.007$), female gender (standardized $\beta = 0.107$, $p = 0.010$), combination oral hypoglycaemic agents (OHA) and insulin (standardized $\beta = -0.182$, $p = 0.002$), monthly income < RM1,000 (standardized $\beta = -0.129$, $p = 0.002$). The entire group of variables significantly predicted self-care behaviour [$F(6, 539) = 15.79$, $p < 0.001$, adjusted $R^2 = 0.140$] with the total variance of 14.9%. Self-efficacy was identified as the strongest predictor in self-care behaviour.

Conclusion: The findings enable us to identify the specific targeted groups with predicted lower self-care behaviour. This is useful in future planning and implementation of health intervention.

Keywords: self-care behaviour, Health Belief Model, type 2 diabetes mellitus

Abstrak disertasi yang dikemukakan kepada Jabatan Kesihatan Komuniti,
Universiti Putra Malaysia sebagai memenuhi keperluan untuk
Ijazah Sarjana Kesihatan Awam

FAKTOR PERAMAL TINGKAH LAKU PENJAGAAN DIRI MENGGUNAKAN MODEL HEALTH BELIEF DI KALANGAN PESAKIT DIABETES MELLITUS JENIS 2 DI SEBUAH DAERAH DI PULAU PINANG, MALAYSIA

Oleh

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Latar belakang: Prevalen penyakit kencing manis di kalangan penduduk Malaysia berumur ⩾ 18 tahun meningkat dari 11.6% pada tahun 2006 ke 17.5% pada tahun 2015. Di Pulau Pinang (PP), prevalen penyakit kencing manis adalah 18.1% pada tahun 2015. Hanya 21% pesakit kencing manis jenis 2 (T2DM) di PP yang diaudit mencapai *haemoglobin* A1c < 6.5% pada tahun 2012. Penjagaan diri yang baik akan mendorong kawalan paras gula dan mengurangkan risiko komplikasi T2DM.

Objektif: Objektif kajian ini adalah untuk menentukan tahap penjagaan diri dan faktor peramalnya dengan menggunakan model *Health Belief* (HBM) di kalangan pesakit T2DM di klinik kesihatan daerah Seberang Perai Selatan, Pulau Pinang.

Metodologi: Kajian keratan rentas analitika dijalankan atas 546 pesakit T2DM yang berumur ⩾18 tahun, mereka dilibatkan dalam kajian melalui kaedah persampelan rawak mudah. Borang soal selidik yang mempunyai kesahan digunakan dalam kajian ini, data dianalisa melalui SPSS versi 22.0.

Keputusan: Responden mengamalkan penjagaan diri sebanyak 3.4 (SD = 1.11) hari dalam seminggu yang lepas. Faktor peramal penjagaan diri adalah efikasi diri (standardized $\beta = 0.257$, $p < 0.001$), berpengetahuan (standardized $\beta = 0.112$, $p = 0.007$), wanita (standardized $\beta = 0.107$, $p = 0.010$), menggunakan rawatan pil dan insulin (standardized $\beta = -0.182$, $p = 0.002$), berpendapatan bulanan < RM1,000 (standardized $\beta = -0.129$, $p = 0.002$). Semua pembolehubah ini dengan ketara meramalkan penjagaan diri

[F (6, 539) = 15.79, $p < 0.001$, adjusted $R^2 = 0.140$] dengan jumlah variasi 14.9%. Efikasi diri merupakan faktor peramal penjagaan diri yang paling kuat.
Kesimpulan: Penemuan kajian ini membolehkan kita mengenalpasti golongan yang diramal rendah penjagaan diri. Ini membantu dalam rancangan dan implementasi intervensi kesihatan pada masa depan.

Kata Kunci: penjagaan diri, model *Health Belief*, diabetes mellitus jenis 2

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I certify that a Dissertation Examination Committee has met on 1st August 2017 to conduct the final examination of Kang Chia Yee on her dissertation entitled "Predictors of self-care behaviour using Health Belief Model among type 2 diabetes mellitus patients in a disctrict of Penang, 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 of Public Health.

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This is to confirm that:

- the research conducted and the writing of this dissertation was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

AADE	American Association of Diabetes Educator
ADCM	Adult Diabetes Control and Management Registry
AOR	Adjusted odds ratios
CI	Confidence interval
€	Euro currency
ESRD	End stage renal disease
HBM	Health Belief Model
HR	Hazard ratio
IQR	Interquartile range
LTPA	Leisure time physical activities
MET	Metabolic equivalent of task
NHMS	National Health and Morbidity Survey
OHA	Oral hypoglycaemic agent
OR	Odds ratio
RCT	Randomized controlled trial
RM	Ringgit Malaysia
SD	Standard deviation
SDSCA	Summary of Diabetes Self-care Activities
SMBG	Self-monitoring of blood glucose
T2DM	Type 2 diabetes mellitus
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background

Diabetes mellitus is a chronic non communicable disease that is either due to pancreatic dysfunction whereby pancreatic cells unable to produce adequate insulin (Type 1 diabetes mellitus) or the insulin produced is dysfunction (Type 2 diabetes mellitus). In order to differentiate the type of diabetes, sophisticated lab test is required thus global separate prevalence data of these 2 types of diabetes is not available. Type 2 diabetes mellitus (T2DM) contributes to the majority burden of diabetes mellitus especially among adults.

World Health Organization (WHO) reported the tremendous increasing trend of diabetes mellitus from affecting 108 million adults in year 1980 to 422 million adults in year 2014 globally. About 9.1% or 1 in 11 person have diabetes mellitus worldwide (WHO, 2016). Diabetes mellitus directly caused 1.5 million deaths worldwide in 2012, and more than 80% of death happened in low and middle income countries. It was also the 8th leading cause of death globally in 2012. WHO estimated that in 2030, diabetes mellitus will be the 7th leading cause of death worldwide (WHO, 2016).

Diabetes mellitus causes enormous health expenditure and cost in term of direct diabetes treatment cost and indirect diabetes related complication expenditure. A study conducted in Poland from year 2005-2009 revealed that total cost spent on diabetes health care services and diabetic related complication was € 654 million that constituted 2.8% of their country total health care expenditure. In year 2009, the total diabetes expenditure in Poland was € 1.5 billion (Leśniowska, Schubert, Wojna, Skrzekowska-Baran, & Fedyna, 2014).

Untreated or poorly managed diabetes mellitus leads to macrovascular complications (coronary arteries diseases, peripheral arterial diseases, and stroke) and microvascular complications such as diabetic nephropathy, neuropathy and retinopathy. Quality of life in type 2 diabetes mellitus patients is compromised to a certain degree once end up in diabetes complications (Cheah et al., 2012). Thus having good glycaemic control in preventing diabetes complications is the mainstay of diabetes management.

Having positive diabetes self-care behaviour facilitates good glycaemic control. Self-care is defined as the daily tasks that the diabetes mellitus patients perform to manage their disease (Weinger, Butler, Welch, & La Greca, 2005). Diabetes self-care includes monitoring blood glucose, adhere to medications, healthy diet, physically active, good coping skills, efficient problem-solving skills, and risk-reduction behaviour (Shrivastava, Shrivastava, & Ramasamy, 2013). Good diabetes self-care behaviour is determined and affected by multiple factors, and one of the factor is self-efficacy, the individual's belief in his ability to control his diabetes mellitus (Gao et al., 2013).

Patients' attitude and belief towards diabetes disease substantially affect their behaviour in diabetes management. Health Belief Model (HBM) is a well known psychological model in evaluating a person's perception and belief towards the diasese and subsequently predicts their behaviour. Thus in this study, HBM is used to explore the belief and perception (perceived susceptibility and severity of diabetes complications, perceived benefit and barrier of self-care behaviour, cue to action and self-efficacy) of type 2 diabetes mellitus patients towards self-care behaviour. In other words, it helps to determine the predictors of practising diabetes self-care. Understanding patients' perceptions towards diabetes mellitus allows us to have a clearer picture in explaining their health behaviour. Studies showed that perceived susceptibility and severity of the disease, and perceived benefit of recommended action project a positive behaviour change (Adejoh, 2014; Tunceli, 2015). On the other hand, perceived barrier discourages positive behaviour change (Ayele, Tesfa, Abede, Tilahun, & Girma, 2012).

1.2 Problem Statements

According to the Malaysia National Health and Morbidity Survey (NHMS) 2015 that involved 19,935 respondents, diabetes mellitus prevalence was 17.5% (3.5 million) among adults aged 18 years and above as compared to NHMS 2011 the diabetes mellitus prevalence was 15.2% or increased of 15.1% (Institute for Public Health, 2011, 2015). The diabetes mellitus prevalence in Penang state was 18.1% in year 2015, which was higher than the national diabetes mellitus prevalence (Institute for Public Health, 2015). In view of the high and rapidly increasing trend of diabetes mellitus prevalence, it is necessary for us to review and improve on our strategies in diabetic prevention and diabetes management.

In term of glycaemic control, according to the National Diabetic Registry report 2009-2012, the mean HbA1c in audited Type 2 diabetes mellitus (T2DM) patients followed up in health clinics in Malaysia was 8.1% in 2012 with only 23.8% of the patients achieved HbA1c < 6.5%. In Penang state at the same year 2012, only 21% of audited type 2 diabetes mellitus patients achieved HbA1c < 6.5%, the mean HbA1c was 8.0% (Mustapha & Azmi, 2013). The target of diabetes audit is to keep $\geqslant$ 30% of the T2DM patients with HbA1c < 6.5%, there is still a large gap in order to reach this target. This reflected that majority of type 2 diabetes mellitus patients in Malaysia generally and Penang specifically were having uncontrolled diabetes.

Poor glycaemic control leads to increase risk of developing diabetes complications. This condition was seen in 2011, when the prevalence of diabetes macrovascular complications among Malaysian audited diabetes patients were ischaemic heart disease (4.8%) and cerebrovascular disease (1.1%). The prevalence of ischaemic heart disease and cerebrovascular disease among Malaysian audited diabetes patients increased to 5.3% and 1.3% in year 2012. The same increasing trend was also noted in term of prevalence of diabetes microvascular complications, in year 2011 the prevalence of nephropathy was 7.6% and retinopathy was 6.5%, however these prevalence increased to nephropathy (7.8%) and retinopathy (6.7%) in year 2012 (Mustapha & Azmi, 2013). The prevalence of diabetes complication among Malaysian remained increasing each year despite of our public health care service provide almost free of charge and comprehensive diabetes

treatment, our substantial effort in improving diabetic education and diabetes management guidelines, and the constant effort in improving the screening for diabetes complications.

High prevalence of diabetes mellitus and diabetes related complications reduces productivity of our population and causes enormous medical expenses in our country. Measures need to be taken to target this increasing trend of the diabetes mellitus and diabetes complication prevalence. Having good glycaemic control among diabetes mellitus patients is the ultimate goal in diabetes management in order to reduce risk of developing diabetes complications. Good glycaemic control is highly associated with positive diabetes self-care behaviour (Gao et al., 2013).

At present most of our diabetes management plans are focussed on improving health care system and health care services, there are limited local researches in exploring the patients' factors which lead to ineffective diabetes self-care management. The gap is noted especially local researches on behaviours factors that leads to poor glycaemic control are limited. It is timely now to explore diabetes mellitus patients' behavioural issue by using Health Belief Model. The model assists the health care providers to evaluate diabetes mellitus patients' perception and belief towards the disease. By using the findings of this study, a more effective diabetes management approach can be implemented in order to reduce the incidence of diabetes related complication.

1.3 Significance of Study

In view of the increasing trend in the prevalence of diabetes mellitus and diabetes complications in Malaysia, with the heavy diabetes health expenditure burden, it is timely and vital for us to truly identify the predictors of diabetes self-care behaviours among T2DM patients in maintaining good glycaemic control.

Understanding the predictors and barriers in practising diabetes self-care behaviour facilitate the health care providers in managing glycaemic control, slowing the progression of diabetes mellitus and reduce the risk of diabetes complication development. It can also assists the health staff in planning the intervention targeting on the modifiable factors and empower the patients to change their behaviour in diabetes control. A robust, cost effective way of diabetes control measure is needed in order to break the cycle of devastating effect by poor glycaemic control.

1.4 Research Questions

The research questions are

a) What are the diabetes self-care behaviours have been practised by type 2 diabetes mellitus patients?
b) What are the predictors of diabetes self-care behaviour using Health Belief Model (HBM)?

1.5 Objectives

1.5.1 General Objective

The general objective of this study is to determine the diabetes self-care behaviour and its predictors using Health Belief Model (HBM) among type 2 diabetes mellitus patients in health clinics at Seberang Perai Selatan district, Penang.

1.5.2 Specific Objectives

The specific objectives are:

a) To describe the socio-demographic characteristics, diabetes profile, diabetes knowledge and health belief on self-care behaviour among type 2 diabetes mellitus (T2DM) patients.
b) To describe the practice of diabetes self-care behaviour (self-monitoring of blood glucose, dietary control, physical activity, smoking cessation, foot care).
c) To identify the association of diabetes self-care behaviour with
    i. Socio-demographic characteristics (age, gender, educational level, employment status, marital status, monthly income).
    ii. Diabetes profile (duration of diabetes mellitus, type of diabetes treatment).
    iii. Knowledge in diabetes mellitus.
    iv. Perceived susceptibility of diabetes complication.
    v. Perceived severity of diabetes mellitus.
    vi. Perceived benefit of diabetes self-care behaviour.
    vii. Perceived barrier of diabetes self-care behaviour.
    viii. Cue to action of diabetes self-care behaviour.
    ix. Self-efficacy in diabetes self-care behaviour.
d) To determine the predictors of diabetes self-care behaviour.

1.6 Hypotheses

The alternate hypotheses of this study are

H_1: There is an association between diabetes self-care behaviour and socio-demographic characteristics (age, gender, educational level, employment status, marital status, monthly income).
H_2: There is an association between diabetes self-care behaviour and diabetes profile (duration of diabetes, type of diabetes treatment).
H_3: There is an association between diabetes self-care behaviour and knowledge in diabetes complication and its risk factors.
H_4: There is an association between diabetes self-care behaviour and perceived susceptibility of diabetes complication.
H_5: There is an association between diabetes self-care behaviour and perceived severity of diabetes mellitus.
H_6: There is an association between diabetes self-care behaviour and perceived benefit of diabetes self-care behaviour.

H_7: There is an association between diabetes self-care behaviour and perceived barriers of diabetes self-care behaviour.
H_8: There is an association between diabetes self-care behaviour and cue to action of diabetes self-care behaviour.
H_9: There is an association between diabetes self-care behaviour and self-efficacy of diabetes self-care behaviour.

1.7 Conceptual Definition of Terms

1.7.1 Diabetes Self-care Behaviours

The American Association of Diabetes Educators (AADE) established a framework for successful diabetes self-care and self-management named AADE7 Self-Care Behaviours. This framework includes monitoring blood sugar, stay active, healthy diet, adhere to medications, healthy coping, problem solving and reducing risks (American Association of Diabetes Educators, 2008). In this study, reducing risks and complications part was being assessed by foot care, smoking cessation, self-monitoring of blood glucose (SMBG). The healthy coping and problem solving are not being evaluated in this study.

1.7.2 Diabetes Complications

Unfavourable evolution of diabetes mellitus and ends up in damage of kidneys, heart, eyes, nerves and blood vessels. It can be subdivided into macrovascular complications (coronary arteries diseases, peripheral arterial diseases and stroke) and microvascular complications (diabetes nephropathy, neuropathy and retinopathy). Macrovascular disease is the disease that affects large blood vessels of the body whilst microvascular disease involve small blood vessels.

1.7.3 Health Belief Model (HBM)

Health belief model (HBM) is a psychological model that evaluate the individual's perception and belief towards illness, subsequently explain their health behaviour. It was first developed in 1950s by a group of social psychologists named Hochbaum, Rosenstock and Kegels who worked in the U.S Public Health Services. The model was used to explain the reason for failure of tuberculosis health screening offered in their service (Hochbaum, 1958). The original model consists of 4 domains which includes perceived susceptibility, perceived severity, perceived benefits and perceived barriers towards the disease. The cue to action and self-efficacy domains are added to the model later.

1.7.3.1 Perceived Susceptibility

One's belief in chances of getting the disease.

1.7.3.2 Perceived Severity

One's opinion in the seriousness of the condition or disease and the consequences of it.

1.7.3.3 Perceived Benefits

One's belief in the desired result of the advised action in order to decrease the risk or consequence of the disease.

1.7.3.4 Perceived Barriers

One's opinion in the obstacles in behavioural change to adapt the advised action.

1.7.3.5 Cue to Action

Object, event or people that move the person to change their behaviour.

1.7.3.6 Self-efficacy

The belief of diabetes patients in their capabilities in performing certain advised measures to control their blood sugar. The measures include adhere to diabetes treatment, self-monitoring of blood glucose (SMBG), dietary control, physically active, blood pressure control, smoking cessation and foot care.

REFERENCES

Adejoh, S. O. (2014). Diabetes knowledge, health belief, and diabetes management among the Igala, Nigeria. *SAGE Open*, *4*(2), 1–8. doi.org/10.1177/2158244014539966

Ahmad Sharoni, S. K., Shdaifat, E. A., Mohd Abd Majid, H. A., Shohor, N. A., Ahmad, F., & Zakaria, Z. (2015). Social support and self-care activities among the elderly patients with diabetes in Kelantan. *Malaysian Family Physician*, *10*(1), 34–43.

Ajala, O., English, P., & Pinkney, J. (2013). Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. *The American Journal of Clinical Nutrition*, *97*(3), 505–516. doi.org/10.3945/ajcn.112.042457

Al Subhi, L., Kendall, P., Al-Shafaee, M., & Al-Adawi, S. (2016). Health beliefs of people with type 2 diabetes in primary health care in Muscat , Oman: A qualitative approach. *International Journal of Clinical Nutrition & Dietetics*, *2*(1), 1–7. doi.org/10.15344/ijcnd/2016/106

Amente, T., Belachew Teferea, Endalew, H., & Negalign Berhanu. (2014). Self-care practice and its predictors among adults with diabetes mellitus on follow up at Nekemte Hospital diabetes clinic, West Ethiopia. *World Journal of Medicine and Medical Science*, *2*(3), 1–16.

American Association of Diabetes Educators. (2008). AADE7 Self-Care Behaviors. *The Diabetes Educator*, *34*(3), 445–449. doi.org/10.1177/0145721708316625

Ashur, S. T., Shah, S. A., Bosseri, S., Tong, S. F., & Shamsuddin, K. (2016). Glycaemic control status among type 2 diabetic patients and the role of their diabetes coping behaviours: A clinic-based study in Tripoli, Libya. *Libyan Journal of Medicine*, *11*, 1–9. doi.org/10.3402/ljm.v11.31086

Ayele, K., Tesfa, B., Abebe, L., Tilahun, T., & Girma, E. (2012). Self care behavior among patients with diabetes in Harari, Eastern Ethiopia: The Health Belief Model perspective. *PLoS ONE*, *7*(4), e35515. doi.org/10.1371/journal.pone.0035515

Bellew, B., Greenhalgh, E., & Winstanley, M. (2015). Smoking and Diabetes. In M. In Scollo, MM and Winstanley (Ed.), *Tobacco in Australia: Facts & Issues* (pp. 104–108). Melbourne, Australia: Cancer Council Victoria.

Bohanny, W., Wu, S. F. V., Liu, C. Y., Yeh, S. H., Tsay, S. L., & Wang, T. J. (2013). Health literacy, self-efficacy, and self-care behaviors in patients with type 2 diabetes mellitus. *Journal of the American Association of Nurse Practitioners*, *25*(9), 495–502. doi.org/10.1111/1745-7599.12017

Borhaninejad, V., Iranpour, A., Shati, M., Naghibzadeh Tahami, A., Yousefzadeh, G., & Fadayevatan, R. (2016). Predictors of self-care among the elderly with diabetes type 2: Using Social Cognitive Theory. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *11*(3), 163–166. doi.org/10.1016/j.dsx.2016.08.017

Bourne, R. R. A., Stevens, G. A., White, R. A., Smith, J. L., Flaxman, S. R., Price, H., … Taylor, H. R. (2013). Causes of vision loss worldwide, 1990-2010: A systematic analysis. *The Lancet Global Health*, *1*, e339–e349. doi.org/10.1016/S2214-109X(13)70113-X

Brooks, G. P., & Barcikowski, R. S. (1994). *A new sample size formula for regression.* Pickerington. doi.org/ED419696

Burner, E. R., Menchine, M. D., Kubicek, K., Robles, M., & Arora, S. (2014). Perceptions of successful cues to action and opportunities to augment behavioral triggers in diabetes self-management: Qualitative analysis of a mobile intervention for low-income latinos with diabetes. *Journal of Medical Internet Research*, *16*(1), 1–8. doi.org/10.2196/jmir.2881

Büyükkaya Besen, D., Günüsen, N., Sürücü, H. A., & Kosar, C. (2016). Predictor effect of Locus Of Control (LOC) on self-care activities and metabolic control in individuals with type 2 diabetes. *Peer Journal*, *4*(1), e2722. doi.org/10.7717/peerj.2722

Cheah, W., Lee, P., Lim, P., Fatin Nabila, A., Luk, K., & Nur Iwana, A. (2012). Perception of quality of life among people with diabetes. *Malaysian Family Physician Journal*, *7*(2–3), 21–30.

Chin, Y. F., Huang, T. T., & Hsu, B. R. S. (2013). Impact of action cues, self-efficacy and perceived barriers on daily foot exam practice in type 2 diabetes mellitus patients with peripheral neuropathy. *Journal of Clinical Nursing*, *22*(1–2), 61–68. doi.org/10.1111/j.1365-2702.2012.04291.x

Chin, Y. F., Liang, J., Wang, W. S., Hsu, R. S., & Huang, T. T. (2014). The role of foot self-care behavior on developing foot ulcers in diabetic patients with peripheral neuropathy: A prospective study. *International Journal of Nursing Studies*, *51*(12), 1568–1574. doi.org/10.1016/j.ijnurstu.2014.05.001

Dehghani-Tafti, A., Mazloomy Mahmoodabad, S. S., Morowatisharifabad, M. A., Afkhami Ardakani, M., Rezaeipandari, H., & Lotfi, M. H. (2015). Determinants of self-care in diabetic patients based on Health Belief Model. *Global Journal of Health Science*, *7*(5), 33–42. doi.org/10.5539/gjhs.v7n5p33

Etesamifard, T., Ahmadi Jouybari, T., Zinat-Motlagh, F., Mahbodi, M., Aghaei, A., & Ataee, M. (2014). Is the Health Belief Model as an appropriate predictor of the self-care behaviors in type II diabetic patients? *Journal of Biology and Today's World*, *3*(12), 275–279. doi.org/10.15412/JBTW.xxxx

Gao, J., Wang, J., Zheng, P., Haardörfer, R., Kegler, M. C., Zhu, Y., … Osborn, C. (2013). Effects of self-care, self-efficacy, social support on glycemic control in adults with type 2 diabetes. *BMC Family Practice 2013*, *14*(1), 66–72. doi.org/10.1186/1471-2296-14-66

Gopichandran, V., Lyndon, S., Angel, M. K., Manayalil, B. P., Blessy, K. R., Alex, R. G., … Balraj, V. (2012). Diabetes self-care activities: A community-based survey in urban southern India. *National Medical Journal of India*, *25*(1), 14–17.

Gunggu, A., Chang, C. T., & Cheah, W. L. (2016). Predictors of diabetes self-management among type 2 diabetes patients. *Journal of Diabetes Research*, *2016*. doi.org/10.1155/2016/9158943

Harwood, E., Bunn, C., Caton, S., & Simmons, D. (2013). Addressing barriers to diabetes care and self-care in general practice: A new framework for practice nurses. *Journal of Diabetes Nursing*, *17*(5), 186–191.

Hochbaum, G. M. (1958). *Public participation in medical screening programs: A socio-psychological study*. *Public Health Service Publication*. Washington, DC: US Government Printing Office.

Huang, C.-H., Lin, P.-C., Yeh, M. C., & Lee, P.-H. (2017). A Study on Self-Care Behaviors and Related Factors in Diabetes Patients. *The Journal of Nursing*, *64(1)*, 61–69. doi.org/10.6224/JN

Institute for Public Health. (2008). *The third National Health and Morbidity Survey 2006 (NHMS III): Diabetes mellitus*. Kuala Lumpur: Ministry of Health Malaysia.

Institute for Public Health. (2011). *National Health and Morbidity Survey 2011 (NHMS 2011): Non-communicable diseases* (Vol. 2). Kuala Lumpur: Ministry of Health Malaysia. doi.org/10.1017/CBO9781107415324.004

Institute for Public Health. (2015). *National health and morbidity survey 2015 (NHMS 2015): Non-communicable diseases, risk factors & other health problems* (Vol. 2). Kuala Lumpur: Ministry of Health Malaysia. doi.org/10.1017/CBO9781107415324.004

International Diabetes Federation. (2015). *IDF Diabetes Atlas. 7th edition. International Diabetes Federation*. Brussels, Belgium: International Diabates Federation.

Karimy, M., Araban, M., Zareban, I., Taher, M., & Abedi, A. (2016). Determinants of adherence to self-care behavior among women with type 2 diabetes: An explanation based on health belief model. *Medical Journal of the Islamic Republic of Iran*, *30*, 368.

Kassahun, T., Gesesew, H., Mwanri, L., & Eshetie, T. (2016). Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: A cross-sectional survey. *BMC Endocrine Disorders*, *16*(1), 28. doi.org/10.1186/s12902-016-0114-x

Kueh, Y. C., Morris, T., Borkoles, E., & Shee, H. (2015). Modelling of diabetes knowledge, attitudes, self-management, and quality of life: A cross-sectional study with an Australian sample. *Health and Quality of Life Outcomes*, *13*, 129. doi.org/10.1186/s12955-015-0303-8

Kurnia, A. D., Amatayakul, A., & Karuncharernpanit, S. (2017). Predictors of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model. *International Journal of Nursing Sciences*, *4*(3), 260–265. doi.org/10.1016/j.ijnss.2017.06.010

Leśniowska, J., Schubert, A., Wojna, M., Skrzekowska-Baran, I., & Fedyna, M. (2014). Costs of diabetes and its complications in Poland. *European Journal of Health Economics*, *15*(6), 653–660. doi.org/10.1007/s10198-013-0513-0

Mathew, R., Gucciardi, E., De Melo, M., & Barata, P. (2012). Self-management experiences among men and women with type 2 diabetes mellitus: A qualitative analysis. *BMC Family Practice*, *13*(1), 122. doi.org/10.1186/1471-2296-13-122

Mustapha, F. I., & Azmi, S. (2013). *National Diabetes Registry Report* (Vol. 1). Kuala Lumpur: Ministry of Health Malaysia. doi.org/10.2337/dc14-S014

Ong, W. M., Chua, S. S., & Ng, C. J. (2014). Barriers and facilitators to self-monitoring of blood glucose in people with type 2 diabetes using insulin: A qualitative study. *Patient Preference and Adherence*, *8*, 237–246. doi.org/10.2147/PPA.S57567

Reisi, M., Mostafavi, F., Javadzade, H., Mahaki, B., Tavassoli, E., & Sharifirad, G. (2016). Impact of health literacy, self-efficacy, and outcome expectations on adherence to self-care behaviors in iranians with type 2 diabetes. *Oman Medical Journal*, *31*(1), 52–59. doi.org/10.5001/omj.2016.10

Saleh, F., Mumu, S. J., Ara, F., Begum, H. A., & Ali, L. (2012). Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetics in Bangladesh: A cross-sectional study. *BMC Public Health*, *12*, 1112. doi.org/10.1186/1471-2458-12-1112

Sarwar, N., Gao, P., Kondapally Seshasai, S., Gobin, R., Kaptoge, S., & Angelantonio, E. D. (2010). Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: A collaborative meta-analysis of 102 prospective studies. *The Lancet*, *375*(9733), 2215–2222. doi.org/10.1016/S0140-6736(10)60484-9

Schwab, T., Meyer, J., & Merrell, R. (1994). Measuring attitudes and health beliefs among Mexican Americans with diabetes. *Diabetes Educator*, *20*(3), 221–227.

Shariff-Ghazali, S., Ismail, M., Cheong, A. T., Adam, B. M., Haniff, J., Lee, P. Y., … Chew, B. H. (2015). Predictors of poor glycaemic control in older patients with type 2 diabetes mellitus. *Singapore Medical Journal*, *56*(5), 284–290. doi.org/10.11622/smedj.2015055

Sharoni, S. K. A., & Wu, S. F. V. (2012). Self-efficacy and self-care behavior of Malaysian patients with type 2 diabetes: A cross sectional survey. *Nursing and Health Sciences*, *14*(1), 38–45. doi.org/10.1111/j.1442-2018.2011.00658.x

Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. *Journal of Diabetes & Metabolic Disorders*, *12*(1), 14. doi.org/10.1186/2251-6581-12-14

Sone, H., Tanaka, S., Tanaka, S., Suzuki, S., Seino, H., Hanyu, O., … Yamada, N. (2013). Leisure-time physical activity is a significant predictor of stroke and total mortality in Japanese patients with type 2 diabetes: Analysis from the Japan Diabetes Complications Study (JDCS). *Diabetologia*, *56*(5), 1021–1030. doi.org/10.1007/s00125-012-2810-z

Stiffler, D., Cullen, D., & Luna, G. (2014). Diabetes barriers and self-care management: The patient perspective. *Clinical Nursing Research*, *23*(6), 601–626. doi.org/10.1177/1054773813507948

Stretcher, V., & Rosenstock, I. M. (1997). The Health Belief Model. In K. Glanz, F.M. Lewis, & B.K. Rimer (Eds.). *Cambridge handbook of psychology, health and medicine* (pp. 113–117). San Francisco: Jossey-Bass.

Tan, M. Y. (2004). The relationship of health beliefs and complication prevention behaviors of Chinese individuals with type 2 diabetes mellitus. *Diabetes Research and Clinical Practice*, *66*, 71–77. doi.org/10.1016/j.diabres.2004.02.021

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The Summary of Diabetes Self-Care. *Diabetes Care Journal*, *23*(7), 943–950. doi.org/10.2337/diacare.23.7.943

Tunceli, K., Iglay, K., Zhao, C., Brodovicz, K. G., & Radican, L. (2015). Factors associated with adherence to oral antihyperglycemic monotherapy in patients with type 2 diabetes mellitus in the United Kingdom. *Diabetes Research and Clinical Practice*, *109*(3), e27–e31. doi.org/10.1016/j.diabres.2015.05.031

Vazini, H., & Barati, M. (2014). The Health Belief Model and self-care behaviors among type 2 diabetic patients. *Iranian Journal of Diabetes And Obesity*, *6*(3), 107–113.

Weinger, K., Butler, H. A., Welch, G. W., & La Greca, A. M. (2005). Measuring diabetes self-care: A psychometric analysis of the self-care inventory-revised with adults. *Diabetes Care*, *28*(6), 1346–1352. doi.org/10.2337/diacare.28.6.1346

WHO. (n.d.). WHO Mortality Database. Retrieved November 17, 2016, from http://apps.who.int/healthinfo/statistics/mortality/whodpms/

WHO. (2016). *Global Report on Diabetes* (Vol. 1). Geneva, Switzerland: WHO.

Wolever, R. Q., & Dreusicke, M. H. (2016). Integrative health coaching: A behavior skills approach that improves HbA1c and pharmacy claims-derived medication adherence. *BMJ Open Diabetes Research & Care*, *4*(1), e000201. doi.org/10.1136/bmjdrc-2016-000201