ORIGINAL ARTICLE

Factors predicting preventive behaviors of type 2 pre-diabetes in Mueang District, Phitsanulok Province, Thailand

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Abstract

SuphunnakuL P, Charonesrimaung S, Singhadej O, Songthap A and Junsukon, E. Factors predicting preventive behaviors of type 2 pre-diabetes in Amphoe Mueang, Phitsanulok Province, Thailand.
J Pub Health Dev. 2018;16(3):55-66

   This research was to examine factors predicting preventive behaviors of type 2 pre - diabetes in Mueang District, Phitsanulok Province. A total of 430 participants who has not been diagnosed with diabetes and had fasting blood sugar between 100-125 mg/dl. A multi-stage sampling technique was used to recruit participants from 24 primary care units in Mueang District, Phitsanulok Province. Data were collected using a questionnaire with an overall Cronbach's alpha coefficient of 0.82. Data were analyzed using descriptive statistics and stepwise multiple regression at significant level of 0.05.

   The results showed that 56.0% were females. Most of them (78.1%) were married and, 48.4% aged 60 years and over with the mean of 56.97 years and S.D. of 10.49. The majority of them (41.6%) completed secondary school level. Most of the participants (44.0%), had their body mass index (BMI) between 23.00 - 24.99 with the mean of 23.68 and S.D. of 1.47. Most of all had diabetes knowledge, overall social support, self- efficacy, and preventive behaviors at good level (44.0, 55.8, 49.8 and 65.8% respectively). The strongest predictor for preventive behaviors of Type 2 pre - diabetes was village health volunteer support (Beta = 0.253, p – value <0.001) followed by self-efficacy (Beta = 0.223, p-value <0.001) and family support (Beta = 0.202, p – value = 0.002), respectively. These factors accounted for 36.5% predicting preventive behaviours of Type 2 pre- diabetes.

   In conclusion, healthcare providers should promote type 2 pre-diabetes on increasing their self-efficacy in order change behaviors for preventing the disease. Moreover, health volunteers and family members should follow up and support continuously to decrease risk of type 2 diabetes.

Keywords: type 2 diabetes, preventive behaviors, pre-diabetes

ปัจจัยพยากรณ์พฤติกรรมป้องกันโรคเบาหวานชนิดที่ 2 ของกลุ่มเสี่ยงในอำเภอเมือง จังหวัดพิษณุโลก ประเทศไทย

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ปัจจัยพยากรณ์พฤติกรรมป้องกันโรคเบาหวานชนิดที่ 2 ของกลุ่มเสี่ยงในอำเภอเมือง จังหวัดพิษณุโลก ประเทศไทย
ว. สาธารณสุขและการพัฒนา 2561;16 (3):55-66

　　　　การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่ใช้พยากรณ์พฤติกรรมป้องกันโรคเบาหวานชนิดที่ 2 ของกลุ่มเสี่ยง
เขตอำเภอเมือง จังหวัดพิษณุโลก กลุ่มตัวอย่าง 430 คน คือบุคคลที่ยังไม่ได้รับการวินิจฉัยว่าเป็นโรคเบาหวาน
และ มีระดับน้ำตาลในเลือดระหว่าง 100 - 125 mg/dl คัดเลือกมาจาก 24 โรงพยาบาลส่งเสริมสุขภาพตำบล
ในเขตอำเภอเมือง จังหวัดพิษณุโลก ด้วยการสุ่มแบบหลายขั้นตอน เก็บรวบรวมข้อมูลด้วยแบบสอบถามที่มีค่า
ครอนบาค แอลฟาของแบบสอบถามในภาพรวมเท่ากับ 0.82 วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและการวิเคราะห์
การถดถอยพหุแบบขั้นตอน (Stepwise Multiple Regression Analysis) ที่ระดับนัยสำคัญทางสถิติ 0.05

　　　　ผลการวิจัย พบกลุ่มตัวอย่างเป็นเพศหญิง ร้อยละ 56.0 มีสถานภาพสมรส ร้อยละ 78.1 มีอายุ 60 ปี ขึ้นไป
มากที่สุดร้อยละ 48.4 อายุเฉลี่ยเท่ากับ 56.97 ปี ส่วนเบี่ยงเบนมาตรฐานเท่ากับ 10.49 มีค่าดัชนีมวลกายอยู่ระหว่าง
23.00-24.99 มากที่สุดร้อยละ 44.0 เฉลี่ย 23.68 ส่วนเบี่ยงเบนมาตรฐานเท่ากับ 1.47 กลุ่มตัวอย่างส่วนใหญ่มีความรู้
เกี่ยวกับโรคเบาหวาน การสนับสนุนทางสังคมในภาพรวม ความเชื่อมั่นในความสามารถในตนเอง และพฤติกรรม
ป้องกันโรคเบาหวานอยู่ในระดับดี ร้อยละ 44.0, 55.8, 49.8, และ 65.8 ตามลำดับ ปัจจัยที่มีอำนาจการพยากรณ์
พฤติกรรมป้องกันโรคเบาหวานชนิดที่ 2 ของกลุ่มเสี่ยงสูงที่สุด ได้แก่ การได้รับการดูแลจากอาสาสมัครสาธารณสุข
ประจำหมู่บ้าน (Beta = 0.253, p-value < 0.001) รองลงมาได้แก่ การรับรู้ความสามารถแห่งตน (Beta = 0.223,
p-value <0.001) และ การได้รับการดูแลจากครอบครัว (Beta = 0.202, p-value = 0.002) ตามลำดับ โดยปัจจัย
ทั้ง 3 มีอำนาจในการพยากรณ์พฤติกรรมป้องกันโรคเบาหวานชนิดที่ 2 ของกลุ่มเสี่ยงได้ร้อยละ 36.5

　　　　ข้อสรุป บุคลากรสาธารณสุขควรส่งเสริมกลุ่มเสี่ยงโรคเบาหวานให้รับรู้ความสามารถของตนเองเพื่อการปรับ
เปลี่ยนพฤติกรรมในการป้องกันโรค รวมถึงการส่งเสริมให้กลุ่มเสี่ยงได้รับการดูแลและติดตามอย่างต่อเนื่องจาก
อาสาสมัครสาธารณสุขและบุคคลในครอบครัว อันจะช่วยให้ลดความเสี่ยงของการเกิดเบาหวานชนิดที่ 2 ได้

คำสำคัญ: โรคเบาหวานชนิดที่ 2 พฤติกรรมป้องกัน กลุ่มเสี่ยงเบาหวาน

Introduction

The prevalence of diabetes mellitus (DM) has been increasing overtime worldwide. Type 2 diabetes mellitus (T2DM) accounted approximately 90% of the people with diabetes around the world. It can come on slowly, usually over 40 years of age.[1] It is a major cause of morbidity and mortality among the global population.[1] The cumulative number of patients with T2DM has increased in every country. Among those greater than 80% live in developing countries. In 2014, there were 387 million people suffered from T2DM. Of these, 46.3% were undiagnosed and 77% of them live in low- and middle-income countries[2]. The greatest number of people with T2DM was found to be between 40 and 59 years of age. Furthermore, healthcare expenditure of patients with T2DM increased from 548 billion USD in 2013 to 612 billion USD in 2014.[3] The health care expenditures for elderly people (60-69 years old) demonstrated the highest proportion.[2-3] Moreover, the number of people with T2DM was expected to increase from 387 million in 2013 to 592 million in 2035.[3] The World Health Organization (WHO) predicted that diabetes will be the 7th leading cause of death in 2030.[1] Common consequent complications of diabetes worldwide involved cardiovascular diseases, retinopathy, and kidney failure. Adults with diabetes have a two to three folds increased risk of heart attacks and strokes.[4] Diabetic retinopathy is an important cause of blindness, and occurs as a result of long-term accumulated damage to the small blood vessels in the retina. Of 2.6% of global blindness can be attributable by diabetes.[5] Moreover, diabetes is the leading causes of kidney failure.[6]

In Thailand, the results from a health survey during 1971-2009 indicated that the prevalence rate of T2DM was more likely to increase significantly. The prevalence rate of T2DM was 2500 in 1971 and rose to 6900 per 100,000 population in 2009.[7] The morbidity rate in T2DM patients during 2007– 2013 was 795.04, 844.90, 879.58, 954.18, 968.22, 1,050.05, and 1,081.25 per 100,000 population respectively. In 2008, the mortality rate of T2DM patients aged 60 years and over was 73.3 per 100,000 population.[8] In 2013, 4.2 million people had T2DM and approximately 28% of them were undiagnosed. Moreover, 79.6% had uncontrolled blood sugar (HbA1C > 7.0%), 14.9% suffered from complications such as retinopathy, 2.1% had foot ulcers, and 1.1% had cardiovascular disease. Currently, healthcare expenditures due to T2DM in Thailand is 47.5 billion THB.[9] The complications of T2DM not only damage the blood vessels, and nerves, but also result in a poor health-related quality of life.[10]

In 2013-2015, the report of the Bureau of Non-Communicable Disease Control Department, showed that patients with type 2 diabetes in Phitsanulok Provinces had 37,987, 36,325 and 42,613 cases respectively. At the same time, the incidence was found 11,417, 10,211 and 12,902 cases respectively.[11] In 2014 - 2016, Phitsanulok Province conducted screening for diabetes in people aged 35 years and over and found 10,510, 13,122 and 14,595 T2DM patients in Mueang District. In 2015 – 2017, the incident rate of T2DM in Mueang District, Phitsanulok Province were 561.54, 805.87, 1,068.72, per 100,000 population.[12]

The previous studies indicated that factors associated with self-care behaviors in patients with T2DM included age,[13] educational level,[14] monthly

income,[13-14] marital status,13 gender,[14-15] body mass index (BMI),[15-16] diabetes knowledge,[17] social support,[18] and self- efficacy.[19-20] However, almost previous studies conducted using self-care behaviors in type 2 diabetes patients. The present study focused mainly on preventive behaviors among pre-diabetes. In addition, the researcher adopted 2 theories used as a framework for this study included self – efficacy[21] and social support theory[22].

The purpose of this study was to determine factors predicting preventive behaviors of type 2 pre - diabetes in Mueang District, Phitsanulok Province. The research findings can be utilized to develop the effective program in order to promote preventive behaviors of T2DM and improve quality of life in the risk group.

Methods

Study population

This predictive research involved 24 primary care units (PCU) in Mueang District, Phitsanulok Province. The data collection was conducted from September, 2017 to March, 2018. The study population were 14,595 cases.[12]

The inclusion criteria were as follows: 1) persons who has not been diagnosed with diabetes by a medical doctor, 2) had fasting blood glucose between 100 - 125 mg/dl,[23] 3) able to communicate and understand Thai language, 4) have lived in the investigated community in the ensuing 6 months, and 5) willing to participate in this study.

The exclusion criteria: Participants have moved from the study area during data collection.

Sample size

In this study, there were 11 predictive variables included gender, age, educational level, monthly income, marital status, BMI, self - efficacy, diabetes knowledge, family support, friend support, and village health volunteers (VHV) support. The sample size was calculated based on the formula to estimate the mean[24] with the confidence interval of 95% and acceptance error of 0.05. Therefore, total number of the samples in this study was 430.

Research Instrument

A self-administered questionnaire was employed for data collection. Validity and reliability tests were performed on 35 persons of the risk group. The questionnaire had an overall Cronbach's alpha coefficient of 0.82 and it consisted of 5 parts as follows:

Part I: Personal characteristics; included age, educational level, monthly income, marital status, gender, and BMI.

Part II: Diabetes knowledge; This measure was defined as participants' understanding about the information and its management about type 2 diabetes including 12 items. Participants received 1 score for the correct answer and 0 for the incorrect or unknown answer. The score ranged from 0 to 12. The KR-20 coefficient of this part was 0.81.

Part III: Self – efficacy; The self-efficacy had 10-items on 5-point scale ranked from 1 = Not confident at all, 2 = Not very confident, 3 = Somewhat confident, 4 = Confident and 5= Extremely confident with Cronbach's alpha coefficient of 0.84.

Part IV: Social support; Social support was classified into 3 categories: family, friend, and village health volunteer consisting of 24 items. The scale

for measuring was a 5-point Likert-type scale ranked from 0 = Not at all, 1 = slightly, 2 = somewhat, 3 = A lot and 4 = a great degree. The Cronbach's alpha coefficient of this part was 0.82.

Part V: Preventive behaviors of T2DM; There were six essential behaviors for risk population including healthy eating, being physically active, monitoring of blood sugar, good problem-solving skills, healthy coping skills, and risk-reduction behaviors. This questionnaire included 16 items. The scale for measuring was a 3-point Likert-type scale ranked from 0= never, 1= sometimes, 2 = regular. The Cronbach's alpha coefficient of this part was 0.82.

Data collection

The research team made an appointment with the samples at the primary care units to explain the objective of the study and to sign in the consent form for participation. Then, the samples were requested to complete the self-administered questionnaire. The study was carried out between September, 2017 and March, 2018.

Data analysis

The data were collected using a questionnaire and analyzed by descriptive statistics, including percentage, frequency, mean, standard deviation, minimum and maximum values. These statistics were used to explain socio-demographic characteristics of the samples. To determine factors predicting preventive behaviors of type 2 diabetes among risk group, stepwise multiple regression analysis was performed.

Ethical consideration

Ethical approval was obtained from the Human Research Ethics Committee, Naresuan University, Thailand (Ref No. 0647/2017).

Results

Personal characteristics of participants

The results showed that 56.0% were females. Most of them (78.1%) were married and, 48.4% aged 60 years and over with the mean of 56.97 years and standard deviation (S.D.) of 10.49. The majority of them (41.6%) completed secondary school level. Most of the participants (44.0%), had their body mass index (BMI) between 23.00 - 24.99 with the mean of 23.68 and S.D. of 1.47 as shown in Table 1.

Most of all had diabetes knowledge, overall social support, self- efficacy, and preventive behaviors at good level (44.0, 55.8, 49.8 and 65.8% respectively) as shown in Table 2.

The correlation between independent variables and preventive behaviors of type 2 pre – diabetes showed that VHV support was the highest positively associated with prevention behavior (r= 0.554) followed by family support (r= 0.543), and self-efficacy (r=0.516) respectively. However, age, income, BMI, and diabetes knowledge were correlated with preventive behaviors of type 2 diabetes in low level (r = 0.024, 0.010, -0.057, and -0.022, respectively). The correlation between independent variables and preventive behaviors of type 2 pre-diabetes are showed in Table 3

The results of stepwise multiple regression analysis in the final model (model 3) found that the strongest predictor for preventive behaviors of T2 pre - diabetes was VHV support (Beta = 0.253,

p- value <0.001) followed by self-efficacy (Beta = 0.223, p-value <0.001) and family support (Beta = 0.202, p- value = 0.002) respectively. These factors accounted for 36.5% predicting preventive behaviours of T2 pre – diabetes at the significance level of 0.05 as shown in Table 4.

Predicted Equation:

$$Y = 11.369 + 0.140 \text{ (VHV support)} + 0.229 \text{ (self – efficacy)} + 0.170 \text{ (family support)}$$

Table 1   Distribution of respondents by the personal characteristics

Personal characteristics	Number	Percent
Gender		
Male	189	44.0
Female	241	56.0
Age (year)		
35-40	52	12.0
41-50	54	12.6
51-60	116	27.0
60 and over	208	48.4
$\bar{x}$ = 56.97, S.D.= 10.49, Min = 35, Max = 78		
Educational level		
No schooling	37	8.6
Primary school	149	34.7
Secondary school	179	41.6
Bachelor degree	65	15.1
Marital status		
Single	22	5.2
Married	336	78.1
Divorced	23	5.3
Widowed	49	11.4
BMI (kg/m^2)^a		
18.51-22.99	151	35.1
23.00-24.99	189	44.0
25.00-29.99	90	20.9
$\bar{x}$ = 23.68, S.D. = 1.47, Min = 20.03, Mix = 29.99		

a Body weight in kilograms divided by the square of the height in meters, the Asian
cut-off point for overweight (WHO, 2000):s was >23 kg/m^2

Table 2   The percentage of respondents by diabetes knowledge, supporting, self-efficacy and preventive behaviors of type 2 pre diabetes

Variables	Good (%)	Moderate (%)	Poor (%)
Diabetes knowledge	44.0	18.6	37.4
Overall social support	55.8	24.2	20.0
Friend support	54.2	15.6	30.2
Family support	54.2	13.0	32.8
VHV support	57.9	42.1	-
Self- efficacy	49.8	6.5	43.7
Preventive behaviors of type 2 pre-diabetes	65.8	34.2	-

Table 3   Correlation between independent variables and preventive behaviors of type 2 pre-diabetes

Independent variables	Preventive behaviors (r)
Age	0.024
Income	0.010
BMI	-0.057
Self-efficacy	0.516
Diabetes knowledge	-0.022
VHV support	0.554
Family support	0.543

Table 4   Factors predicting preventive behaviors of type 2 pre - diabetes

Factors	b	Std. Error	Beta (β)	t	p - value
Model 1 Constant 16.648 R^2 = 0.307, Adj R^2 = 0.305 R^2 Change = 0.307					
VHV support	0.307	0.022	0.554	13.767	<0.001**
Model 2 Constant 11.345 R^2 = 0.350, Adj R^2 = 0.347 R^2 Change = 0.043					
VHV support	0.210	0.028	0.379	7.427	<0.001**
Self - efficacy	0.279	0.052	0.272	5.323	<0.001**
Model 3 Constant 11.369 R^2 = 0.365, Adj R^2 = 0.360 R^2 Change = 0.015					
VHV support	0.140	0.036	0.253	3.913	<0.001**
Self - efficacy	0.229	0.054	0.223	4.214	<0.001**
Family support	0.170	0.054	0.202	3.128	0.002**

**p-value < 0.01

Discussion

Self-efficacy indicated as the strongest preventive behaviors predictor of T2DM among risk group when other variables were kept constant (Beta = 0.223, p-value < 0.001). Self-efficacy displayed a positive relationship with preventive behaviors of T2DM. The level of preventive behaviors increased with increased self-efficacy. It can be explained that pre – diabetes perceived self-efficacy on self-prevention behaviors on exercise, food consumption, stress management, and risk factors avoidance. This result was consistent with the study of Christine EW[19] which found that self-efficacy, social support, relation to self-care behaviors. Self-efficacy can motivate patients by leveling the expectations for behavioral changes and affecting the perceived barriers and the level of commitment required to adopt health-promoting behavior.[25] Meanwhile, Yoo H, Kim CJ, Jang Y, You MA.[26] had proved the direct relation between self-efficacy and self-care behavior in the patients. Walker RJ, Gebregziabher M, Martin-Harris B, Egede LE.[27] found that self-efficacy was a strong predictor of flexible self-care. The results of this study was consistent with the results of Piampong C [28]; Suksomporn S[29] which found that social support was positively correlated with health promoting behaviors and self-reports of hypertensive patients.

Village health volunteer support and family support, namely social support, were interpersonal influence that was positively correlated with preventive behaviors (Beta = 0.253, p-value < 0.001; Beta = 0.202, p-value = 0.002) respectively. These results were attributed to that social support can influence preventive behaviors. It might be the pre-diabetes have received the information on preventive behaviors from family and VHV support such as exercise, food

consumption, stress management, and risk factors avoidance. Consequencely, pre-diabetes can control the risk factors by themselves. Similarly, Rad GS, Bakht LA, Feizi A, Mohebi S.[18] found that social support were positively correlated with preventive behaviors with statistically significant at 0.05. The results of this study was consistent with the results of Piampong C[28]; Suksomporn S.[29] which found that social support was positively correlated with health promoting behaviors and self-reports of diabetic patients. Likewise, Fisher EB, Boothroyd RI, Coufal MM, Baumann LC, Mbanya JC, Rotheram-Borus MJ et al[30] found that peer support could help T2DM patients to manage and reduce the risks effectively. Similarly, Wilson W, Ary DV, Biglan A, Glasgow RE, Toobert DJ, Campbell D R.[31] reported that social support was a significant predictor of adherence to dietary habits, physical activities, and blood glucose monitoring. In the same way, several studies of social support on chronic disease have found that social support affected self-management.[14,32] Additionally, Vaccaro JA, Exebio JC, Zarini GG, Huffman FG.[33] demonstrated that family and friend social support (FSS) was associated with diabetes self-management(DSM). The studies conducted by Christine[19] and Rad, Bakht, Feizi, Mohebi 18 found a positive relationship between social support and self-care behaviors. The findings of this study were not consistent with the study of Chlebowy DO, Garvin.[34] which did not identify the association between social support and self-care behaviors (e.g, diet and physical activities). Similarity, Supaporn, Nantiya, Nantawon at el.[35] showed that family support was not associated with self-care behaviors (p-value < 0.05).

Limitation of the study

In this study, the researcher focused on studying among Type2 pre - diabetes who has not been diagnosed with diabetes by a medical doctor, had fasting blood glucose between 100 - 125 mg/dl and measured only once before data collection.

Recommendation

Healthcare providers should promote type 2 pre-diabetes on increasing their self-efficacy in order change behaviors for preventing the disease. Moreover, health volunteers and family members should follow up and support continuously to decrease risk of type 2 diabetes.

Recommendation on future research

Applying research results to develop a behavioral modification program for pre – diabetes to reduce the incidence of diabetes.

Acknowledgments

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