Original article

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Factors Influencing the Preventive Health Behaviors and Mental Health among Type-II DM Patients at Upper North Region in Thailand

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Abstract

The dramatic increase in mental health problems is a common comorbidity in type-II diabetic DM (type 2) patients which if they lack of preventive health behaviors leads to severity of clinical consequence. **Objective:** The survey research aimed to study the preventive health behaviors and mental health of DM (type 2) patients, to examine factors associated with the preventive health behaviors and mental health of DM (type 2) patients and to examine factors associated with poor mental health of DM (type 2) patients. **Methodology:** Tools were the questionnaires on personal factors, the preventive health behaviors test developed by Numsri W. (2006) and the mental health test developed by the Department of Mental health. The reliability was 0.70 (KR-20) and 0.70 (Alpha coefficient), respectively. Data were analyzed using descriptive statistics, Chi-square test and Pearson's correlation was used to examine factors associated with the preventive health behaviors and mental health and also Binary logistic regression was used to analyze the data with a variable selection in Forward Stepwise (Likelihood Ratio: LR). **Results:** Overall, 52.98% of the subjects had high level of protective health behaviors and 47.8% of them had normal level of mental health. The significantly factors related to preventive health behaviors of DM (type 2) patients Iumien Tribe (non-Thai) and glycemic control ($p < 0.05$). There was the preventive health behaviors patients related to a mental health level of DM (type 2) as positive direction ($r = 0.366$) ($p<0.01$). Besides, the significantly factors related to mental health of DM (type 2) patients were ethnic group, marital status and duration of the disease ($p < 0.05$) as well as the factors relating poor mental health of DM (type 2) patients were Thai group, Unmarried patients (single/divorced/ widowed/ separated), duration of DM more than 6 years and food control aspect ,which could predict poor mental health level of DM (type 2) patients for 34.5% ($R^2 = 0.345$) and overall percentage of correct classification was 82.1%. **Discussion:** Appropriately dietary control method should be supported by particularly unmarried Thai Type-II DM Patients with duration disease over 6 years in order to make their mental health better. Another point, Should intensively promote a protective health behaviors into both Thai group and the group of inability controls the glucose level in order to avoid severity of clinical outcomes.

Keywords: Health protective behaviors, mental health, Diabetic Mellitus type 2

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Introduction

Diabetes is a serious condition of a chronic disease as global level where transfigure in the main driver in which insulin is generated and used. Insulin is a hormone that enhancing the uptake of glucose, by cells, to generate energy; it also patronizes the gather of glucose as glycogen and responsibility in lipid metabolism. Defect of insulin leads to the blood glucose levels to escalate, with potentially life threatening outcome. The nature of early sign often not obvious, that's why spotting them early can be slightly life- threatening which was resulting in an dramatic extends in the prevalent of disease affecting loss of life and funding for each country. In addition, this disease is a major public health concern. According to the International Diabetes Federation (IDF) estimated that in 2010 the five countries with the largest numbers of people with diabetes are India, China, the United States, Russia and Brazil. In addition, the estimated diabetes prevalence for 2010 is 285 million and is expected to affect 438 million people by 2030. (Boyle et. al, 2001) and 97 % of cases with type 2 diabetes will be a low and middle income countries facing the greatest burden of diabetes (Quin et. al, 2001).

Nowadays, the dramatic increase in overweigh is the main rout behind so many more people living with Type 2 diabetes in the Thailand. According to the annual statistics of Division of non-communicable division based on the Ministry of Public Health, in 2018 - 2020, there were prevalent of disease over 15 -60 years increasingly following a diagnosis of Type 2 diabetes as 840,489 876,970 and 941,226 cases respectively, according to our new analysis released today. As Thailand is current, population was about 425 million and by 2045 the Thai Ministry of Public Health predict that there will rise to 629 million prevalent cases seems like it is for a larger.

In addition, in 2019, there were 9,647 deaths from Diabetes, or an average of 27 cases per day. Mortality rate of Diabetes was 14.93 per 100,000 populations and there were 69,720 patients undergoing diabetes in the hospital under the Ministry of Public Health. The incidence of Diabetes was 1,081.25 per 100,000 populations (according to the fourth Thai Health Status Survey in 2008-2009). The prevalence of diabetes was 96% among those under age 15 seems too high and prevalence increase with age from 0.6% in the age group 15-29 years the highest prevalence was found in the 60-69 years old group; the prevalence of Diabetes was 67% higher in women than men.Importantly, found that 1 in 3 people with diabetes had never been diagnosed with Diabetes before (Absuwan et. al, 2015). Aside from that, people with diabetes are at increased risk of cardiovascular disease 2-9 times more than those without Diabetes (Sitthisook et. al, 1998) which was the leading cause of death in diabetic patients (Aekplakorn et al., 2003; American Diabetes Association (ADA), 2005). In addition, people with diabetes are 1.5-2 times as the risk of hypertension, 2-5 times as risk of cerebrovascular disease as compared to people without diabetes (Sitthisook et. al, 1998).

The greatest risk factor for developing type-II diabetic is age, sex, duration of disease, exercising, dietary, health preventive care and ethnicity can also contribute to someone's risk, with people of northern-Thai people or local people, descent two to four times more likely to develop Type 2 diabetes than ethnic (Tribe) people. Diabetes is also a cause of blindness (retinopathy), And estimated 5-10% of adults aged 65 or older have Diabetes, who was more risk of developing diabetes-related complications including hypoglycemia (low blood sugar), Eye problems (retinopathy), Kidney problems (nephropathy), Nerve damage (neuropathy)

(Hanutsaha et. al, 2008). About half of people with diabetes for over 25 years often with dementia due to diabetes and leads to amputation (Mitrabukdi et. al, 1998). Including infections in the body, which can develop gradually, and can lead to serious damage as reticuloendothelial system if they go unchecked. Acute complications can happen at any time, (Satirapanya et. al, 2008).

In Chaing Rai province, Doi Loung hospital has been screening diabetes risk in population regularly. According to the annual record, the incidence of Diabetes per 100,000 following Doi luang hospital databases in 2018 - 2020 increasing was 141.61, 133 and 182.41 respectively based on diagnosis of Type 2 diabetes. In addition, In 2020, we discovered that new found Diabetes cases has been increasing annually especially in Iumien or tribe group, lived in Doi luang village which 159 people had been tested diabetes risk and only 4 people was identifying diabetes patient.

Doi Loung hospital has been screening diabetes risk in population regularly. According to the annual record, we did screen 74.46 %, 97.38 %, 92.73 % from all population in the area in 2016, 2017, 2018 respectively. In 2016, we found 271 diabetes people or 1411.61 from 100,000 populations. In 2017, we found 133 diabetes people or 578.38 from 100,000 populations. In 2018, we also found 35 diabetes people or 182.41 from 100,000 populations. We discover that new found diabetes rate has been decreasing annually especially in Iumien or tribe group, lived in Doi luang village which 159 people had been tested diabetes risk and only 4 people was identifying diabetes patient in 2018.

According to mental health statistic, the effect of globalization in Thai society from past to present has changed Thai culture excessively. The Thai population behavior becomes more city culture which more self-centers and faces more economical risks and competition all the times. It also changes Thais to become less mercy and kindness. In this situation, any person who cannot adjust themselves to globalization have risk to have mental illness which leads to drugs problem, alcoholic, sexual disease, aggressive, anti-social, depression, suicide, and personal hygiene or health protective behavior.

The mental health has a direct impact on physical health. As similarly, poor mental health can negatively impact on physical health, leading to an increased risk of some conditions. There are various ways in which poor mental health has been shown to be detrimental to physical health. People with the highest levels of self-rated distress (compared to lowest rates of distress) were 32% more likely to have died from cancer.(Batty.G.D. et.al, 2017). Depression has been found to be associated with an increased risk of coronary heart disease.(Khawaja I.S., et.al, 2009) Moreover, People who have higher mental health level can manage stress better, which means they are less likely to develop mental illnesses like depression and anxiety.

According to the annual report of department of mental health, ministry of public health in 2015 to 2019 found that Chiang rai province which was ranked top 5th of Thailand's highest committed suicide increased steadily as mortality rate was 15.12, 14.2, 11.0 and 11.7 per 100,000 populations respectively (Department of Mental Health, Ministry of Public Health, 2018). Besides, the teenager group aged 10-19 years was higher committed suicide group increased steadily by continuing in 2008 - 2012 which was 225, 254, 265, 239 and 287 cases with the most common cause of the problem as health problems, school dropout and poor social interaction etc. (Office of the National Economic and Social Development Council, 2013), the statistics in 2008 to 2010 reported men was three time as committed suicide than women otherwise a women were three time as self-harm than men. Aside from that, The statistics of The World Federation Mental Health : (WFMH) showed 1 of 4 Diabetes

cases comorbiding with depression affecting tended to have poorer self-care such as Dietary, Exercising and also Alcohol drinking which direct affected to occur complications leading to loss of body. As many related studies have shown similar associations. Diabetes patients were thirty time as tend to depression as nondiabetic group as well as finding 9% of depression based on using the interview for diagnosis of depression. Besides that, the prevalence of depression in Diabetes patients are tend to increase higher, which is consistent with the previous study both national and international (Anderson et.al, 2010; Ali et.al, 2006; Mesu et.al, 2008; Somporn et.al 2014), the majority of Type 2 diabetic group was risk of depression significantly higher than in nondiabetic group.

According to, reviewing literature in health beliefs and behaviors of different Tribe group and areas at northern including Chiang mai, Chiang rai and also Mae Hong son found that the consumer culture of tribe differs the local northern person at Doi luang community. There are also other cultural beliefs that involved with health self-care as well as encouraging to Prevent Diabetes Miletus as health belief model implying the health belief based on the practice of individuals in the prevention of disease or intended cooperation in the prevention of the disease, and the contributing factors that lead to the need for the health of the community (Jinathum et. al, 2008; Foofueng et. al, 2019). From the above situation, the researcher team interested to study health protective behavior of Diabetic Mellitus type 2 of tribe groups of Doi Luang in order to apply the results of study for the design of health care systems to improving improve the health better and wellbeing of DM patients people Doi in Luang area, Chiang rai.

Research Methodology

Study population, sample and sampling method

The study was a cross-sectional descriptive study design. The sample of this research was calculated by using TaroYamane (Yamane, 1973) formula with 95% confidence level (according 628 cases of DM (type 2) patients who were treated for 1 year and aged greater than or equal to 35 years old following the standard diagnoses criterion of type-II diabetic of the Clinical Development Guideline for Quality NCD (Diabetes and Hypertension)(Ministry of Public health, 2015), those database from of Doi Luang Hospital,Chiang Rai, Thailand, 2018. As after calculated, the sample sizes of at least for this study was 245 cases following show in figure.1, In order to decrease the error in the study and so far, we has adjusted sample size as 251 cases.

The inclusion criteria were having type 2 diabetes, age between 35 -75 years; and blood glucose does not exceed 300 mg dl. The patients were excluded if being treated with insulin; having severe complications such as renal failure, gangrene, or psychologically ill; and resting systolic blood pressure over 200 mmHg.

Sample Size (n)

N =628, e = 0.05

$$n = \frac{N}{1+Ne^2}$$
$$= \frac{628}{1+(628)(0.05)^2}$$
$$= \frac{628}{1+(628)(0.0025)}$$
$$= \frac{628}{1+1.57}$$
$$= \frac{628}{2.57}$$
$$n = 244.35 \sim 245$$

Figure 1. Formula used for sample size calculation

Research questionairs

For the study, questionnaire is used as the research instrument, the questionnaire form consists of 3 sections; they are;

Section 1: personal information by using multiple choice questionnaires

Section 2: The preventive health behaviors test developed by Numsri W. (2006) as show in figure 2. The methods of data collection are questionnaire through interview. The characteristics of this section use a check-list question as follows;

Score	Means
1	Correct answer
0	Wrong answer or Don't know

HEATH PREVENTIVE BEHAVIOR QUESTIONNAIRE

	YES	NO
EXERCISE ASPECT;		
1. Not only I did house cores, but I also regularly do exercises as 3 time per week	○	○
2. I always do warm up and relax my body prior work out	○	○
3. I decided to choose a right kind of exercise activity into my age and my health	○	○
DRUG USE AND CLINICAL MONITORING ASPECT;		
1. I always have a follow; up doctor's appointment at NCD clinic	○	○
2. I always did not eat or drink at least 8 – 10 hours or with in 12 p.m. prior to the check-up.	○	○
3. When I have a follow; up doctor's appointment, I was checked a blood sugar more frequently by doctors or medical staff	○	○
4. Although I was sick, I regularly still intake a Diabetes drug	○	○
HEALTH SELF-CARE ASPECT;		
1. I always have shower with water and soup as 1-2 time per day	○	○
2. I always wipe with cotton on my body particularly a foldable join area to reduce wetness	○	○
3. I regularly do checkup an Ingrown Toenail, burn wound, abrasions wound and a wound on my feet. If I discover it I will see a doctor immediately	○	○
PREVENTION DISEASE AND TREATING COMPLICATION ASPECT;		
1. I didn't hold in my bladder longtime	○	○
2. Whether I have a blood sugar level as higher than 140 mg/dL or Urinary Frequency Daytime, thirsty and Xerostomia, I will control my sugar dietary Whether I have a Sweating, arrhythmias and also Fainting (syncope) or near fainting, I will intake candy or sugary foods immediately	○	○
3. When my forefoot changes skin color or skin discoloration as purple color, I will see a doctor immediately	○	○
4 I regularly avoid having bare feet walking outside	○	○

Figure 2. A sample of the preventive health behaviors test

The questionnaire consists of 34 items, which divided into 5 aspects as follows;

1) Food control aspect; with 34 items (10 score)
2) Exercise aspect; with 6 items (6 score)
3) Drug use and clinical monitoring aspect; with 6 items (6 score)
4) Health self-care aspect; with 7 items (7 score)
5) Prevention disease and treating complication aspect; with 5 items (5 score)

Interpreting level of the preventive health behaviors was done by compared criteria as follows;

Score	Level of the preventive health behaviors
24 – 34	High level
12 – 23	Moderate level
0 - 11	Low level

Section 3: The Mental Health test developed by the Department of Mental health, Ministry of Public Health and the characteristics of this section use a rating scale with 15 items as show in figure 3. The rating scale is set by Likert, which were divided as follows;

Type of worded items	Criteria			
	Absolutely agree level	Agree level	Indifferent level	Disagree level
Positive-worded items (12 items)	4	3	2	1
Negative-worded items (3 items)	1	2	3	4

Interpreting level of the mental health was done by compared criteria as follows;

Score	Level of the mental health
51–60	High level
44–50	Normal level
Less than or equal to 43	Poor level

GENERAL HEALTH QUESTIONNAIRE (GHQ-12)

	Strongly Agree	Agree	Neutral	Disagree
1. Felt you are perfectly enjoy normal day-to-day life	○	○	○	○
2. Been feeling reasonably happy	○	○	○	○
3. Been getting a feeling of hopeless and boring	○	○	○	○
4. Felt feeling low-self esteem	○	○	○	○
5. Felt able to face in your problem	○	○	○	○

Figure 3. A sample of The Mental Health test

Study validation

A structured content of questionnaire was developed to collect the data from the DM type 2 patients which included socio. Demographic information, body mass index: BMI, HbAIC, and diabetes selfcare behavior. The questionnaire was validated by experts in health behaviors and medical, nutrition, and exercise; field tests for reliability were carried out in these two districts where are nearby Doi luang district but not in the study areas. The reliability of the preventive health behaviors test was 0.70 by Kuder-Richardson's Method (KR-20) and the reliability of the mental health test was 0.70 by Cronbach Alpha Coefficient (α-Coefficient).

Data collection

In this study, the probability sampling method was used. The sampling method was systemic random sampling by interviewed Type-II DM Diabetic Mellitus patients who accepted to participate in this study from October 2018 – February 2019.

Data management and analysis

Data were analyzed using descriptive statistics such as frequency and percentage to explain the factor and using Pearson's correlation to assess the correlation between the preventive health behaviors score and the mental health score. Chi-Square test was usd to examine factor associated with the preventive health behaviors level and mental health level of DM patients. Binary logistic regression was also used to examine factors associated with poor mental health level of DM patients and use the Forward Stepwise (Likelihood Ratio: LR) to analyze the data with a classification table method of variable selection, which is method to evaluate the predictive accuracy of the logistic regression model. As observed values show the dependent outcome and the predicted values (at a user defined cut-off value as p= 0.50) are cross-classified. In part of predictive accuracy was considered through the percentage of prediction which if percentage of prediction too high means an predictive accuracy in equation will have a high too.

Ethical concerns

Ethical considerations the study protocol was approved by the Ethics Committee, School of Medicine, University of Phayao (2018)

Study Design

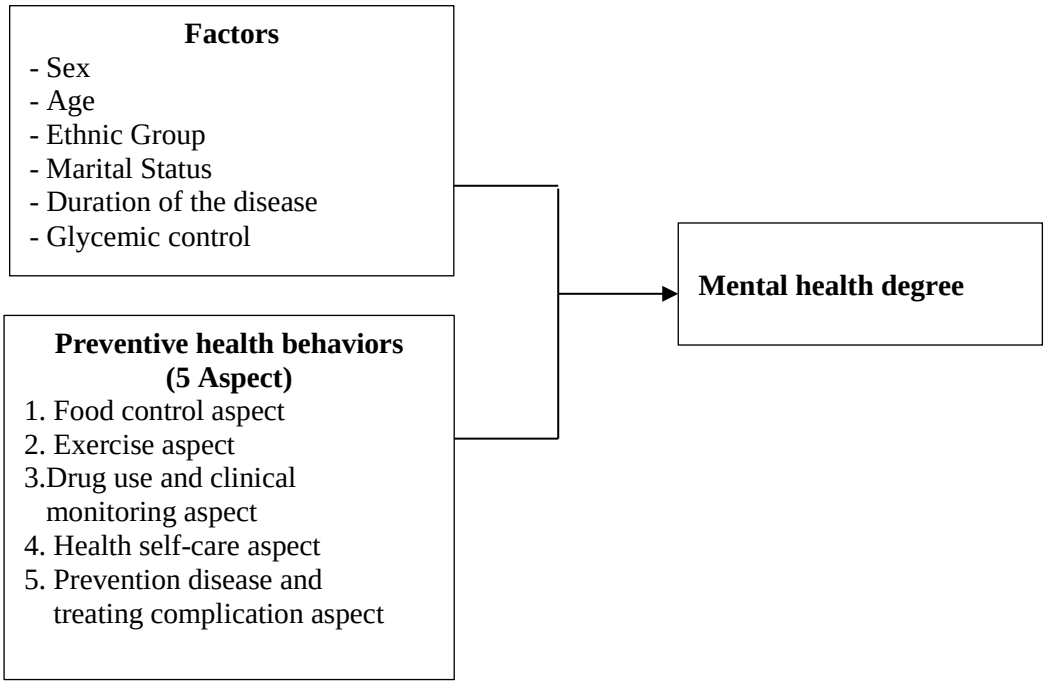


Figure 1: Conceptual Framework

Results

Most of Type-II DM Diabetic Mellitus patients was female (64.5%), married (71.7%), age < 60 years (54.2%), had Thai ethnicity (70.5%), had DM for a duration 6 – 10 years (47.7%) and were in the controlled blood sugar group (64.9%) as show in Table 1.

Table 1. Frequency and percentage of factors

Factors		Frequency (n=251)	Percentage
Sex	Male	89	35.45
	Female	162	64.55
Age	< 60 years	136	54.18
	≥ 60 years	115	45.82
Ethnic group	Thai	177	70.52
	Iumien Tribe (non-Thai)	71	29.48
Marital status	Unmarried (single/ divorced/ widowed/separated)	71	28.28
	Married	180	71.72
Duration of disease	0 – 5 years	81	32.30
	6 – 10 years	119	47.70
	> 10 years	51	20.30
Glycemic control	Controlled blood sugar	163	64.94
	Uncontrolled blood sugar	88	35.06

The preventive health behaviors level and the mental health level

Most of Type- II DM Diabetic Mellitus patients had a high and moderate level of preventive health behaviors. Only a small percentage had low levels of preventive health behaviors as show in Table 2.

Table 2. Frequency and percentage of the preventive health behaviors

The preventive health behaviors level	Frequency (n=251)	Percentage
Low	4	1.60
Moderate	114	45.42
High	133	52.98
Total	**251**	**100.0**

Most of Type-II DM Diabetic Mellitus patients had a normal or high (above normal) level of mental health. Only about a quarter of patients had a poor (below normal) level of mental health as show in Table 3.

Table 3. Frequency and percentage of the mental health

The mental health level	Frequency (n=251)	Percentage
Poor	64	25.50
Normal	120	47.81
High	67	26.69
Total	**251**	**100.0**

Personal factors related to the preventive health behaviors level

The results of the personal factors significantly related to protective health behaviors of DM (type 2) patients were ethnic group and glycemic control (p-value < 0.05) as show in Table 4.

Table 4. χ^2 (p-value) of the preventive health behaviors related factors of DM Type-II patients

Factors	Preventive health behaviors level (n=251)			P-value
	low	moderate	high	
Sex				
Male	2(2.2%)	41 (46.1%)	46 (51.7%)	0.811
Female	2 (1.2%)	73 (45.1%)	87 (53.7%)	
Age				
< 60 years	2(1.5%)	65 (47.8%)	69 (50.7%)	0.793
≥ 60 years	2 (1.7%)	49(42.6%)	64 (55.7%)	
Ethnic group				
Thais	4 (2.3%)	90 (50.8%)	83 (46.9%)	0.010*
Iumien Tribe (non-Thai)	0 (0.0%)	24 (32.4%)	50 (67.6%)	
Marital status				
Unmarried (single/ divorced/ widowed/separated)	3 (4.2%)	34 (47.9%)	34 (47.9%)	0.075
Married	1 (0.6%)	80 (44.4%)	99 (55.0%)	
Duration of disease				
0 – 5 years	0 (0.0%)	38 (46.9%)	43(53.1%)	0.753
6 – 10 years	3(2.5%)	53(44.5%)	63(52.9%)	
> 10 years	1(2.0%)	23 (45.1%)	27 (52.9%)	
Glycemic control				
Controlled blood sugar	1(0.6%)	66 (40.5%)	96(58.9%)	0.014*
Uncontrolled blood sugar	3 (3.4%)	48 (54.5%)	37 (42.0%)	

*Significance at 0.05 level

Personal factors related to mental health level

The results of the personal factors significantly related to mental health of DM (type 2) patients were ethnic group, marital status and duration of the disease ($p< 0.05$) as show in Table 5.

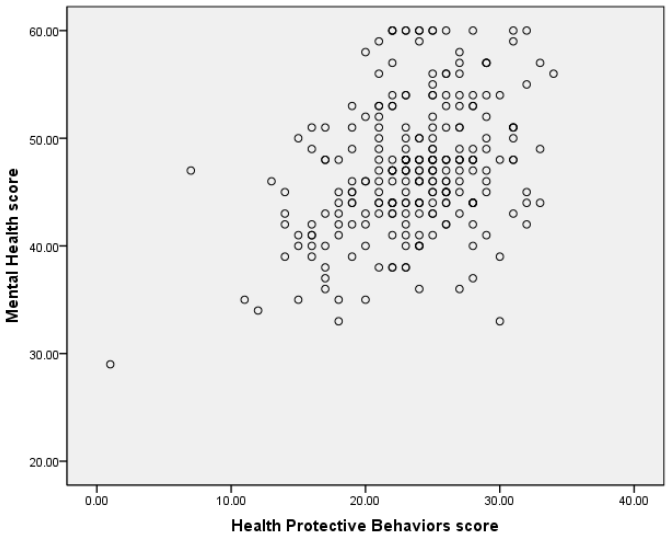
Table 5. χ^2 (p-value) of mental health related factors of DM Type-II patients

Factors	Mental health level (n=251)			P-value
	poor	normal	high	
Sex				
Male	18(20.2%)	44 (49.4%)	27(30.3%)	0.322
Female	46 (28.4%)	76 (46.9%)	40 (24.7%)	
Age				
< 60 years	39 (28.7%)	62 (45.6%)	35(25.7%)	0.453
≥ 60 years	25 (21.7%)	58(50.4%)	32 (27.8%)	
Ethnic group				
Thais	60 (33.9%)	85 (48.0%)	32 (18.1%)	<0.001**
Iumien Tribe (non- Thai)	4 (5.4%)	35 (47.3%)	35 (47.3%)	
Marital status				
single/ divorced/ widowed/separated)	26 (36.6%)	33 (46.5%)	12 (16.9%)	0.015*
Married	38 (21.1%)	87 (48.3%)	55 (30.6%)	
Duration of disease				
0 – 5 years	8(9.9%)	48(59.3%)	25(30.9%)	<0.001**
6 – 10 years	36(30.3%)	46(38.7%)	37(31.1%)	
> 10 years	20(39.2%)	26(51.0%)	5(9.8%)	
Glycemic control				
Controlled blood sugar	40(24.5%)	85 (52.1%)	38 (23.3%)	0.136
Uncontrolled blood sugar	24 (52.1%)	35 (39.8%)	29 (33.0%)	

*Significance at 0.05 level; **Significance at 0.01 level

Correlation between mental health and preventive health behaviors

The results of relationship between mental health score and the preventive health behaviors score was 0.366 (p-value < 0.01) which imply to the protective health behaviors score is increase, the mental health score will increase following at positive direction as Scatter Plot between mental health score and the preventive health behaviors score as show in Figure 5.



r = 0.366**
P-value = <0.001

Figure 5. Scatter Plot between mental health score and the preventive health behaviors score

Factors associated affecting mental health

In Table 5. There was variables including ethnic group, marital status and also duration of disease showed statistically significant associations with mental health level. Interestingly, the percentage of participants with a poor level of mental health was six times higher among participants with Thai ethnicity compared to the Iumien tribe ethnicity. Also, the percentage of participants with poor mental health was higher among the unmarried compared to the married participants. In terms of the duration of having DM, patients with the DM for 5-10 years and disease greater than 10 years had percentages of poor mental health that were triple that of patients with DM for less than 5 years.

Thus, we analyzed the relationship between these three variables (ethnic group, marital status, and duration of disease) and health preventive behaviors (5 aspects) with mental health status using the Binary Logistic Regression model. We used mental health as a dichotomous variable (not poor mental health versus poor mental health). We combined high and normal mental health together to create the variable "not poor mental health."

Assessing for Model Coefficients using forward stepwise variable selection

74.5 % of sample were correctly classified using only, the null model, which contained no independent variables, as shown in Table 6.

Table 6. The observed and predicted classifications in Beginning Block. (Block 0)

Beginning Block

Classification Table[a,b]

	Observed		Predicted		
			Poor Mental Health		
			Not Poor Mental Health	Poor Mental Health	Percentage Correct
Step 0	Poor Mental Health	Not Poor Mental Health	187	0	100.0
		Poor Mental Health	64	0	.0
	Overall Percentage				74.5

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.072	.145	54.818	1	0.000	0.342

Note: Block 0 assesses the usefulness of having a null model, which is a model with no independent variables.

We added selected independent variables (ethnicity, marital status, duration of disease and food control aspects to the model. Table 7 shows the result of the Omnibus Tests of Model Coefficients and the Likelihood Ratio (LR) test. These tests indicate whether the inclusion of this block of variables contributes significantly to improving model fit. In Table 7, the p-value significance of less than 0.05 for block meant that the block 1 model was a significant improvement to the null (block 0) model.

Table 7. **Omnibus Tests of Model Coefficients (Block 1: Method = Enter)**

Omnibus Tests of Model Coefficients

		Chi-square	df	P-value
Step 1	Step	75.428	9	<0.001
	Block	75.428	9	<0.001
	Model	75.428	9	<0.001

Note : Block 1 shows the results after the addition of independent variables selected.

In the case of a good model assessment, it is determined from the percentage of correct classification significantly increase derived from the addition of independent variables. The correct classification rate has increased by 74.5% as (Table 6/Block 0) to 82.1% as show in Table 8 (Table 7/Block 1)

Table 8. The observed and predicted classifications in Block 1.

Classification Table[a]

Observed			Predicted		
			Poor Mental Health		
			Not Poor Mental Health	Poor Mental Health	Percentage Correct
Step 1	Poor Mental Health	Not Poor Mental Health	174	13	93.0
		Poor Mental Health	32	32	50.0
	Overall Percentage				82.1

a. The cut value is .500

In this section, we discussed as model summary, in order to identify variables associated with poor mental health level using binary logistic regression model. Next, we examined personal factors with strong associations with mental health level (ethnic group, marital status and duration of the disease) and the preventive health behaviors (food control aspect, exercise aspect, drug use and clinical monitoring aspect, health self-care aspect and prevention disease and treating complication aspect).We were interested which factors associated with mental health as poor level more by using binary logistic regression with a variable selection in forward stepwise method (Likelihood Ratio: LR). The forward stepwise method (Likelihood Ratio : LR) consisted of an entry testing based on the significance of the score statistic , and removal testing based on the probability of likelihood-ratio statistic based on maximum partial likelihood estimates.

The results of variable selection in Forward Stepwise method (Likelihood Ratio: LR) found that the factors significantly related to mental health level of DM (type 2) patients were Thai group has mental health level rather than tribe group to 7.730 times. (OR = 7.730, 95% CI = 2.564-23.301) , unmarried patients (single/ divorced/ widowed/separated) has poor mental health level rather than couple patients (married) to 2.047 times (OR = 2.047, 95% CI = 1.010-4.151), duration of the disease 6-10 years patients has poor mental health level rather than duration of the disease 0-5 years patients to 4.085 times (OR = 4.805, 95% CI = 1.942-11.891), duration of the disease more than 10 years patients has poor mental health level rather than duration of the disease 0-5 years patients to 6.699 times (OR = 6.699, 95% CI = 2.407-18.645) and food control aspect is a protective factor, which leads to 27% lower risk of poor mental health level (OR=0.73, means 1-0.73=0.27 or 27% lower risk), which if patient group has the preventive health behaviors in food control aspects too high affects their poor mental health will have low too as 27% compared to those with another preventive health behavior.

The results founded that these factors could predict mental health level of DM (type 2) patients for 34.5% (Nagelkerke R^2 = 0.345) and overall percentage of correct classification was 82.1% show in Table 9.

Table 9. Variables in the equation by binary logistic regression (Forward Stepwise method)

Factor	B	S.E	Wald	df	Exp (B)	95%CI for Exp (B)	p-value
Unmarried	0.717	0.361	3.949	1	2.047	1.010 - 4.151	0.047
Duration 6 – 10 y	1.570	0.462	11.530	1	4.805	1.942 – 11.891	0.001
Duration > 10 y	1.902	0.522	13.262	1	6.699	2.407 – 18.646	0.000
Food control aspect	-0.311	0.078	15.977	1	0.733	0.629 - 0.853	0.000
Thai group	2.045	0.563	13.198	1	7.730	2.564– 23.301	0.000
Constant	-2.090	0.834	6.282	1	0.124		0.012
Over rate of correct classification = 82.1%. R^2 = 0.345							

Discussion

The Preventive Health Behaviors in Type 2 DM Patients

Overall, 52.98% of the subjects had high level of protective health behaviors and 47.8% of them had normal level of mental health. The personal factors significantly related to protective health behaviors of DM (type 2) patients were ethnic group and glycemic control ($p< 0.05$) According to the study, most of the populations were adults and elderly, which corresponds to the incidence of metabolic disorders and found that the disorder can occur at any ages. But the rate of illness is over 60 years, followed by 45-60 years, 30 - 44 years, and below 30 years respectively. (Diabetes Association Of Thailand Under The Patronage Of Her Royal Highness Princess Maha Chakir Sirindhorn, The Endocrine Society of Thailand et. al, 2011; Arbsuwan et. al, 2015). The sample group has a health protective behavior as moderate level and the majority of the population is employed in agriculture. As a direct interview process of researcher team found that their life style is quite unchanged from the past, rarely accept modern technology or innovation. Most lifestyles are sufficiency, living with a low cost of living. Most of the the sample group are extended families, who supportive of each other. Most of the the context is consistent with the natural way, for instance, self-cooking by using organic ingredients.

The Mental Health in Type 2 DM Patients

The living area is surrounded by nature and is far away from source of pollution whether the industrial factory that discharges various waste (Jinathum et. al, 2018). Although the sample group is located in a remote area of Chiang Rai province. Proactive work and patient monitoring in remote areas of health professional team continue to work seriously at every moment. Care and monitoring of patients is not just physical care, but there are also social and psychological care which called holistic health care (Worabutr et. al, 2017; Jinathum et. al, 2018). As a result, the sample group in Doi Luang District has good health care behaviours and good mental health as the previous study (Wearbuezha et. al, 2008; Suriart, et. al, 2014) found that prisoners, who

have metabolic disorders have health protective behaviour level as moderate. In terms of mental health, which is consistent with the previous study (Latiffah et.al, 2005; Tasuwanin et.al, 2008; Suriyawong et.al, 2011)

The related factor of preventive health behaviors including;

Ethnic group (Iumien)

Ethnic group, who is Diabetic Mellitus type 2 in Doi Luang area, will receive medicines at Doi Luang hospital and Health promoting hospital. The important point that Ethnic group have a higher level of health protective behavior than normal Thais group is the proactive operation of health professional team from Doi Luang Hospital for remoted areas by monitoring with Holistic health care. And another point, Ethnic group is self-employed in agriculture. As for Thai group, they will work as agriculture in terms of employees who must work in accordance with their employers, which sometimes results in the inability to leave for follow-up treatment that can cause lack of treatment (Tasuwanin et.al, 2008)

Glycemic control

Glycemic control patients have health protective behavior higher than inability of Glycemic control patients. Referring to practical following to clinical guidance of diabetes is not only following by clinical guidance but it is also important for dietary behavior and exercise.

The result of this study showed that exercise factor of the samples group will be lower than normal. Not only have the patients who have health protective behavior during the treatment of diabetes but they also had to control the sugar blood level. The majority of sample group thinks that they can control their sugar blood levels by take medicines regardless to appropriate dietary consumption and exercise properly (Foofueng et. al, 2019).

There was a relationship between the preventive health behaviors of DM (type 2) patients and a mental health level ($r = 0.366$) ($p<0.01$) As is evident from, Preventive health behaviors related with mental health level of this study is significant and found that majority of sample group, had both moderate level of Preventive health behaviors and normal level to high level of mental health level. Referring to my previous argument, the influence of mental health affects moods, affects, thought and reactions to various situations in their life which if they have good mental health, will be able to manage with any problems better consciously

The related factor of mental health including;

Thai group

In Doi Luang District, which is considered as a rural area and there are language restrictions, because they lack of translation of health information into the native Ioumien tribal language. As Thai patients also facing barriers to reading the health information due to educational level or illiteracy. Therefore, causing lack of awareness and perceived health status. As a result, most of the Thai group refuses to accept they are chronic disease (Jinathum et. al, 2018; Foofueng et. al, 2019). Therefore, the group have methods of looking at illness from spiritual things. And another point is Thai group refuses to acknowledge that they are ill which can cause that group to be less aware of the risk and violence (Katon et.al, 2004; Pulphonthub et.al, 2005; Walaiporn et.al, 2009; Egede et.al, 2010; Kamble et.al, 2012).

In conclusion, our nationally representative data show that Indians and, more strikingly, Pakistanis had significantly increased odds of suboptimal control than the White Scottish population both before and after adjusting for potential confounders, whereas proportions with suboptimal glycaemic control were similar to the Scottish population in Chinese or African-Caribbean groups. The role of other factors such as treatment-specific responses, physician to patient communication as way to improve glycaemic control in South Asians and the association between glycaemic control and complications of diabetes including hospital admissions are clearly relevant areas for future research.

Duration of the disease

Duration of exposing disease longer affected with the risk of have mental health problems higher, which is consistent with the previous study both national and international (Suppaso et.al, 2010; Egede et.al, 2010; Ali et.al, 2006; Kitkaw et.al, 2011), which found the majority of patients group who perceive a violence of illness are risk of have mental health problems higher than those who didn't perceive a violence of illness.

Alone patients

According to the study, Couple group have a higher level of mental health than alone group (single/ divorced/widowed/separated), is probably majority of the couple group have a spouse who is also reassurance of each other's both physical and mental while those alone group is quite an independence person, lack of companion in life and also being desensitized by self, which sometimes results in their mental health (Somboonsit et.al, 1992)

Food control aspect

The majority of sample population is an agriculture in rapid social change, as for both group, they will work as agriculture in terms of employees who must work in accordance with their employers, which sometimes results in these group spending time working hugely to earn a living under both pressure and stressor resulting an inability to food control appropriately for disease, which direct affects glycemic control level and risk of severe complication highly into their body soon (Kaengrang et.al, 2017)

Research Implication

The results of these study can be used to guide the practice of protective health behaviors particularly focusing on appropriately dietary control into relevant institutions, which have to work with a Thai DM type 2 patients who is an inability to glycemic control as moderate level. Second, these result is also applicable to the development of mental health promotion strategy into a Thais DM type 2 patients who have been exposed greater-than or equal to 6 years of this disease and have lived alone.

Suggestions for the future study

In the further study, Researcher teams should study as qualitative study of the preventive health behaviors and mental health into Thai DM type 2 patients for more deeply understand. In addition, should analyze the related factors as form of the equation as well as to should analyze the composition to determine the factors affected protective health behaviors and mental health into DM type 2 patients in order to improve the activities of both protective health behaviors and mental health which correspond to the context of the patient more.

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