



## Prevalence and Risk Factors of Depression in Thai Diabetic Patients.

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### Abstract

**Objective:** The goal of this study was to determine the prevalence of depression in Thai diabetic patients and to examine clinical characteristics of diabetes that are associated with depression.

**Research design and methods:** Diabetic patients from diabetic clinic of Ramathibodi hospital who had no known history of depression were studied. The Thai version of the Patient Health Questionnaire (PHQ-9) was used to screen for depression. Clinical characteristics and laboratory data of patients were obtained from medical records. Multivariate logistic regression was used to determine the independent risk factors of depression.

**Results:** Three-hundred eighty-five individuals were participated. The prevalence of depression was 15.8%. By univariate analysis, risk factors that were associated with depression included education less than primary school, treatment with insulin and poor glycemic control ( $HbA1C \geq 8\%$ ). However, with multivariate logistic regression analysis, only education less than primary school and treatment with insulin were two significant risk factors associated with depression in diabetic patients.

**Conclusions:** The prevalence of depression among diabetic patients in diabetic clinic of Ramathibodi hospital was unexpectedly high. Education less than primary school and treatment with insulin were the independent risk factors of depression in Thai diabetic patients.

**Keywords:** depression, diabetes mellitus, risk factors, prevalence, screening

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## Introduction

Diabetes is a risk factor for atherosclerotic and microvascular complications, which could result in impaired physical function and depression.<sup>(1,2)</sup> Diabetes is also associated with other co-morbid diseases such as coronary artery disease, hypertension, stroke and vision problem, which could be the causes of mood disorder.<sup>(3)</sup> Both physical disability and diabetes-related co-morbid conditions might be the contributing causes of depression in diabetic patients.

Depression in both type 1 and type 2 diabetes has been associated not only with poorly controlled disease but also with variety of diabetes micro- and macrovascular complications.<sup>(4,5)</sup> Diabetic patients with depression have much higher general health care costs than those without.<sup>(6,7)</sup> The estimated mortality rates are about 2-fold higher in depressed diabetic patients.<sup>(8)</sup> From several previous studies, the independent risk factors of a major depression in diabetic patients included younger age, female sex, less education, being unmarried, obesity ( $BMI \geq 30 \text{ kg/m}^2$ ), smoking, low income, perceived worsening of health status, higher non-diabetic medical co-morbidity, higher numbers of diabetes complications, treatment with insulin, and higher HbA1c levels.<sup>(9,10)</sup> The evidences from randomized controlled trials in diabetic patients with depression showed that improving depression using anti-depressant was associated with a significant decrease in HbA1c levels.<sup>(11,12)</sup>

Many studies have shown a strong relationship between depression and diabetes. In the meta-analysis of 42 studies which were conducted in American and European diabetic populations showed an estimated prevalence of major depression of 11% and elevated depression symptoms of 31% based on structured psychiatric interviews and depression-rating scales respectively.<sup>(13)</sup> The presence of diabetes doubled the odds of having depression. In addition, when the data of well-controlled studies were analyzed, the mean unadjusted prevalence of depression in diabetes was

20.5 %, compared with that of 11.4 % in non-diabetic subjects. The relationship between depression and diabetes has been confirmed by several studies in Asian diabetic population.<sup>(14-17)</sup> For examples, the prevalence of depression among Bangladesh diabetes population was 29 %<sup>(15)</sup> which was similar to the prevalence found in Chinese and Korean population. Moreover, one study from Iran showed very high prevalence of major depression (71.8 %) in diabetic patients.<sup>(16)</sup>

In Thailand, from national mental health survey conducted in 2003, the prevalence of depression in general populations was 3.2 % in male and 4.0 % in female.<sup>(18)</sup> Since there has no report concerning the prevalence of depression in Thai diabetic patients, this study was conducted to examine the prevalence of depression in a sample of individuals with type 1 and type 2 diabetes and to determine the independent risk factors associated with depression in Thai diabetes populations.

## Method

### Study participants

The 15 years of age or older patients who had been diagnosed with diabetes and had been followed at the outpatient diabetic clinic of Ramathibodi hospital from May to December 2008 were studied

### Exclusion criteria

Patients who could not communicate or understand the study questionnaires, patients with gestational diabetes or with the previous diagnosis of major depression were excluded.

### Screening tool for depression

The Patient Health Questionnaire (PHQ)-9 was used to screen for depression. The PHQ-9 is a standardized screening and diagnostic instrument, with total score ranging from 0 (no depressive symptoms) to 27 (all symptoms occurring daily). It can be used

to establish a diagnosis following a categorical algorithm. A major depression was diagnosed if there were 5 or more of the 9 symptoms present at least half a day in the past 2 weeks and one of these symptoms had to be depressed mood or anhedonia (little interest/pleasure in doing things). The PHQ-9 has been found to have high sensitivity (73%) and specificity (98%) for the diagnosis of major depression based on structured psychiatric interview.<sup>(19)</sup>

However, a recent study of the Thai version of the PHQ-9 showed that although the categorical algorithm for detection of major depression provided a high specificity but it had a low sensitivity (53 %) in Thai population<sup>(20)</sup>. However, when the Thai version of the PHQ-9 was examined as a continuous measure, and at the cut-off value of 9 or greater, the sensitivity was increased to 84%, the specificity was 77%, positive predictive value (PPV) was 21% and negative predictive value (NPV) was 99%. Its validity was supported by the area under the curve value of 0.89 which suggests a moderate accuracy of the questionnaire. Since we would like to screen for depression in Thai patients, we decided to choose the Thai version of the PHQ-9 score of 9 or greater as the cut-off point for the positive screening since it has been shown to have high sensitivity and acceptable specificity for the diagnosis of major depression in Thai patients. (The Thai version of the PHQ-9 questionnaire was shown in the appendix.)

Characteristics of patients which included age, sex, level of education, marital status, height and weight, duration of diabetes, current smoking status, alcohol drinking and type of diabetes were collected. The complications of diabetes which included macrovascular (cerebrovascular disease, coronary artery disease, history of limb amputation and intermittent claudication) and microvascular complications (diabetic neuropathy, nephropathy and retinopathy), co-morbid diseases (hypertension, dyslipidemia and chronic kidney disease) and type of

treatment were obtained from medical record. Glycemic control indicated by HbA1C level was also obtained from medical record at the time as close as possible to the day when the PHQ-9 questionnaire was surveyed.

### Statistical analysis

To determine risk factors of depression, the differences of socio-demographic, behavioral, and clinical variables between patients with and without depression defined by positive or negative screening of the Thai version of the PHQ-9 respectively were examined by using chi-square tests for categorical variables and by unpaired-T test for continuous variables. Multivariate logistic regression was used to examine the independent risk factors for depression.

The study was reviewed and approved by the Ethical Committee of Ramathibodi hospital. All participants signed informed consent before beginning the study.

### Results

Characteristics of patients in the study were summarized in Table 1. Three-hundred eighty-five individuals participated in this study. The majority of patients was female, elderly, married and had education up to the level of secondary school. Most patients had long-standing type 2 diabetes with poor glycemic control. Half of the patients had at least one microvascular complications whereas only 15% had macrovascular complications. Oral hypoglycemic agents were used in 80% of the patients and almost half needed insulin therapy.

The prevalence of depression was 15.8%. Table 2 showed the differences of socio-demographic and clinical variables between patients with and without depression. The group with depression had less education (less than primary school), was more associated with poor glycemic control ( $HbA1c \geq 8$ ) and had a higher frequency of treatment with insulin.

**Table 1** Baseline characteristics of subjects

Characteristics	N = 385
Gender: Male/Female	38.4/61.6
Age (years)	58.9 ± 12.5
Marriage status	
- single or living unmarried	31.4
- married	68.6
Education	
- less than primary school	9.6
- primary school	38.7
- secondary school	26
- university or higher	25.7
Current smoking	
- yes/no	7.3/92.7
Alcohol drinking	
- < 3 times/week	2.9
- ≥ 3 times/week	5.4
- not drink	91.7
BMI (kg/m <sup>2</sup> )*	26.2 ± 4.8
Type of diabetes	
- Type 1	2.9
- Type 2	96.6
- Other specific type	3.5
Duration of diabetes (years)*	9.4 ± 7.6
Microvascular complications	
- diabetic neuropathy	3.1
- diabetic nephropathy	34.0
- diabetic retinopathy	29.6
Macrovascular complications	
- cerebrovascular disease	5.2
- coronary artery disease	7.3
- history of limb amputation and intermittent claudication	1.6
Co-morbid diseases	
- hypertension	72.2
- dyslipidemia	86.2
- chronic kidney disease	21.3
Treatments	
- diet control	2.1
- oral hypoglycemic agents	80.8
- insulin	42.3
HbA1C (%)	8.1 ± 1.8

Data are expressed as percent or mean ± SD

However, multivariate logistic regression analysis showed that education less than primary school and treatment with insulin were only the significant independent risk factors for depression as shown in table 3.

## Discussion

As far as we know, this is the first study that determined the prevalence of depression in Thai diabetic patients. We found an unexpectedly high prevalence of depression in the population with diabetes. This prevalence is estimated to be 5 time higher than that in general Thai population.<sup>(18)</sup> The findings of this study support the results of several earlier studies on the relationship between diabetes and depression. The relationship between low education and depression has been reported previously.<sup>(10)</sup> Likewise, higher rate of insulin usage have also been associated with depression in individuals with diabetes.<sup>(4,14)</sup> It is notable that the risk of depression in insulin-treated patients in our study was about 2.8 times greater compared to diet-controlled and oral hypoglycemic drug-treated patients (table 3). This strong relationship between insulin treatment and the presence of depression suggests that screening for depression and more intensive psychological support are required for insulin-treated diabetic patients. It is not clear which factors affected depression in our insulin-treated patients. It is possible that the pain of injection, insulin-induced hypoglycemic episodes, burden of insulin injection on daily activity, dietary restrictions, and the failure of glycemic control may have affected the increased frequency of depression.

However, some of our findings contradict the results of other prior studies.<sup>(9,10)</sup> Our study did not find a relationship between depression and sex, age, marital status, BMI, smoking, alcohol use, type and duration of diabetes, the presence of diabetes complications, or co-morbidity. This discrepancy of result may be explained by the differences of

**Table 2** Comparison of characteristics of diabetes individuals with or without depression

Variable	Total	No depression (PHQ <9)	Depression (PHQ ≥ 9)	P Value
N (%)	385	324 (84.2)	61 (15.8)	
Sex				
Women	237 (61.6)	198 (61.1)	39 (63.9)	0.678
Men	148 (38.4)	126 (38.9)	22 (36.1)	
Age (year)				
15 - 34	12 (3.1)	11 (3.4)	1 (1.6)	0.322
35 - 49	70 (18.2)	55 (17.0)	15 (24.6)	
50 - 64	166 (43.1)	138 (42.6)	28 (45.9)	
> 65	137 (35.6)	120 (37.0)	17 (27.9)	
Education				
Less than primary school	37 (9.6)	27 (8.3)	10 (16.4)	0.035
Primary school	149 (38.7)	133 (41)	16 (26.2)	
Secondary school	100 (26)	79 (24.4)	21 (34.4)	
University or higher	99 (25.7)	85 (26.2)	14 (23.0)	
Marital status				
Married	264 (68.6)	225 (69.4)	39 (63.9)	0.395
Unmarried or not living as married	121 (31.4)	99 (30.6)	22 (36.1)	
BMI (kg/m <sup>2</sup> )				
≤ 18.0	8 (2.1)	6 (1.9)	2 (3.3)	0.348
18.0 - 24.9	163 (42.3)	143 (44.1)	20 (32.8)	
25.0 - 29.9	129 (33.5)	104 (32.1)	25 (41.0)	
≥ 30	85 (22.1)	71 (21.9)	14 (23.0)	
Current smoking	28 (7.3)	25 (7.7)	3 (4.9)	0.595
Alcohol use	32 (8.3)	25 (7.7)	7 (11.5)	0.329
Duration of diabetes (years)				
< 5	114 (29.6)	99 (30.6)	15 (24.6)	0.577
5 - 9	98 (25.5)	80 (24.7)	18 (25.9)	
≥ 10	173 (44.9)	145 (44.8)	28 (45.9)	
Type of diabetes				
Type 1	11 (2.9)	10 (3.1)	1 (1.6)	0.679
Type 2	372 (96.6)	312 (96.3)	60 (98.4)	
Other specific type	2 (3.5)	2 (0.6)	0 (0)	
Presence of microvascular complication	182 (50.7)	154 (50.7)	28 (50.9)	0.973
Presence of macrovascular complication	50 (13)	46 (14.2)	4 (6.6)	0.103
Presence of co-morbid disease	366 (95.1)	308 (95.1)	58 (95.1)	1.000
Insulin usage	163 (42.3)	125 (38.6)	38 (62.3)	0.001
HbA1C (%)				
< 8	239 (62.2)	208 (64.4)	31 (50.8)	0.045
≥ 8	145 (37.8)	115 (35.6)	30 (49.2)	

Data are expressed as number of subjects (%)

**Table 3** Risk factors for depression by multivariate regression analysis

Variable	Adjusted odds ratio	95 % CI
Education less than primary school*		
(Primary school or higher as reference)	2.6	1.1 - 5.6
Insulin usage*	2.8	1.6 - 5.0

\* $p < 0.05$

population ethnics, cultural backgrounds and socio-economic status. Our study was against the meta-analysis study by Lustman et al<sup>(4)</sup> which demonstrated the association of depression and hyperglycemia in patients with diabetes. The higher HbA1c was not associated with the presence of depression after multivariate analysis in our study although its level was slightly higher in patients with depression (8.6%) compared with those without (8.0%). This discrepancy may be explained by the difficulty in achieving HbA1c <8% even in patients who have no depression given long duration of the disease.

There are some limitations in interpreting the results of this study. This analysis is based on cross-sectional data which limited analyses concerning direction of causation. Prospective studies are needed to establish the causal link between depression and diabetes. The use of the patient-rated PHQ-9 may have been associated with an overestimation of the prevalence of depression because diabetes and other medical co-morbidities may cause somatic symptoms that were sometimes mistakenly attributed to

depression. Moreover, the Thai version of the PHQ - 9 is used only as the screening tool for depression therefore the lower specificity for diagnosis of depression is encountered. However, the 15% rate of the depression found in this study is closed to the 11% rate of depression (diagnosis based on structured psychiatric interviews) found in the prior meta-analysis.<sup>(13)</sup>

In conclusion, among Thai diabetic patients who were followed up at diabetic clinic of Ramathibodi hospital, the prevalence of depression was high. Low education and treatment with insulin were the independent risk factors of depression. This indicates that psychological evaluation should be done in all diabetic patients particularly in low-educated and insulin-treated individuals.

## Acknowledgement

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## Appendix: Thai-translated PHQ-9 questionnaire

### แบบสอบถามสุขภาพผู้ป่วย

ชื่อ ..... วันที่ .....

ในช่วง **2 สัปดาห์** ที่ผ่านมา ท่านมีอาการดังต่อไปนี้ บ่อยแค่ไหน

(ทำเครื่องหมาย “” ในช่องที่ตรงกับคำตอบของท่าน)

	ไม่เลย	มีบางวัน ไม่บ่อย	มีค่อนข้าง บ่อย	มีเกือบทุกวัน
1. เปื่อย ทำอะไรก็ไม่เพลิดเพลิน				
2. ไม่สนใจ ซึมเศร้า หรือท้อแท้				
3. หลับยาก หรือหลับฯ ตื่นฯ หรือหลับมากไป				
4. เหนื่อยง่าย หรือไม่ค่อยมีแรง				
5. เปื่อยอาหาร หรือกินมากเกินไป				
6. รู้สึกไม่ดีกับตัวเอง - คิดว่าตัวเองล้มเหลว หรือเป็นคนทำให้ตัวเองหรือครอบครัวผิดหวัง				
7. สามารถเดินทางได้ เช่น ดูโทรทัศน์ พังวิทยุ หรือทำงานที่ต้องใช้ความตั้งใจ				
8. พูดหรือทำอะไรช้าจนคนอื่นมองเห็น หรือกระลับกระลายจนท่านอยู่ไม่นิ่งเหมือนเคย				
9. คิดทำร้ายตนเอง หรือคิดว่าถ้าตายฯ ไปเลี้ยงจะดี				

ถ้าท่านตอบว่ามีอาการไม่ว่าในข้อใดก็ตาม อาการนั้นฯ ทำให้ท่านมีปัญหาในการทำงาน การดูแลลิ่งต่างๆ ในบ้าน หรือการเข้ากับผู้คน หรือไม่

ไม่มีปัญหาเลย	มีปัญหาน้อย	มีปัญหามาก	มีปัญหามากที่สุด



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## ความบุคคล-ปัจจัยเสี่ยงของ ภาวะซึมเศร้าในผู้ป่วยเบาหวานไทย

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### บทคัดย่อ

**วัตถุประสงค์:** เพื่อศึกษาความซุกของภาวะซึมเศร้าในผู้ป่วยเบาหวานไทยและลักษณะทางคลินิกที่เป็นปัจจัยเสี่ยงต่อภาวะซึมเศร้า

**วิธีการวิจัย:** ศึกษาภาคตัดขวางในผู้ป่วยเบาหวานที่รับการรักษาในคลินิกเบาหวานของโรงพยาบาลรามาธิบดี และไม่มีประวัติหรือได้รับการวินิจฉัยเป็นโรคซึมเศร้า โดยใช้แบบสอบถาม PHQ-9 ฉบับภาษาไทย (Thai version of the Patient Health Questionnaire) เป็นเครื่องมือคัดกรองภาวะซึมเศร้า เก็บข้อมูลลักษณะทางคลินิกและผลการตรวจทางห้องปฏิบัติการจากเวชระเบียนนำไปวิเคราะห์ทางปัจจัยเสี่ยงต่อการเกิดภาวะซึมเศร้าโดยอาศัยวิธี multivariate logistic regression

**ผลการศึกษา:** มีผู้ป่วยเข้าร่วมการศึกษาจำนวน 375 ราย พบรความซุกของภาวะซึมเศร้าร้อยละ 15.8 ปัจจัยที่พบรในผู้ป่วยที่มีภาวะซึมเศร้าบ่อยกว่าผู้ป่วยที่ไม่มีภาวะซึมเศร้า ได้แก่ ระดับการศึกษาต่ำกว่าชั้นประถม การรักษาด้วยอินสูลิน และมีระดับ HbA1c  $\geq 8\%$  แต่เมื่อนำปัจจัยเหล่านี้ไปวิเคราะห์โดย multivariate logistic regression พบร่วมปัจจัยอิสระที่ลัมพันธ์กับภาวะซึมเศร้า ได้แก่ ระดับการศึกษาต่ำกว่าชั้นประถมและการรักษาด้วยอินสูลิน

**สรุปผลการศึกษา:** ผู้ป่วยเบาหวานที่รับการรักษาในคลินิกเบาหวานของโรงพยาบาลรามาธิบดีมีความซุกของภาวะซึมเศร้าค่อนข้างสูง ระดับการศึกษาต่ำกว่าชั้นประถมและการรักษาด้วยอินสูลินเป็นปัจจัยอิสระที่ลัมพันธ์กับภาวะซึมเศร้าในผู้ป่วยเบาหวานไทย

**คำสำคัญ:** ภาวะซึมเศร้า โรคเบาหวาน ปัจจัยเสี่ยง ความซุก การคัดกรอง

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