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Original Research Article

Relationship between diabetes-related distress and control of diabetes in type 2 diabetes patients in primary care units in Phra Nakhon Si Ayutthaya

Panithi Thaipreecha[1], Kod Phithakwongrojn[1], Tatree Bosittipichet[1], Thanakamon Leesri[2]*

[1]Department of Social Medicine, Phra Nakhon Si Ayutthaya Hospital, Phra Nakhon Si Ayutthaya, Thailand
[2]School of Community Health Nursing, Nursing Institution, Suranaree University of Technology, Thailand

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***Correspondence:**
Dr. Thanakamon Leesri,
E-mail: thanakamon@sut.ac.th

ABSTRACT

Background: This study aimed to study the association between diabetes-related distress (DRD) and glycemic control, as well as to identify factors influencing glycemic controlled among patients with type 2 diabetes mellitus (T2DM) attending a primary care unit in Phra Nakhon Si Ayutthaya Province.
Methods: Data were collected from 60 patients with type 2 diabetes at a primary care facility in Phra Nakhon Si Ayutthaya from December of 2024 to May of 2025. Multivariable logistic regression analysis was used to evaluate the relationships between the variables.
Results: The study found that total 60 participants, 33 achieved good glycemic control, while 27 had uncontrolled levels. The analysis revealed no statistically significant association between diabetes-related distress and glycemic control (multivariable marginal OR 2.40; 95% CI: 0.36–16.21; p value=0.368). However, factors significantly associated with uncontrolled glycemic levels included age under 65 years (multivariable marginal OR 2.88; 95% CI: 1.04–7.97; p value=0.041) and a duration of diabetes exceeding 10 years (multivariable marginal OR 5.88; 95% CI: 1.93–17.93; p value=0.002).
Conclusions: This study found no significant association between diabetes-related distress and glycemic control. However, two factors were significantly linked to uncontrolled blood sugar levels: being under 65 years old and having diabetes for more than 10 years.

Keywords: Type 2 diabetes mellitus, Diabetes-related distress, Glycemic control

INTRODUCTION

Diabetes mellitus is a chronic non-communicable disease and a major global public health problem. According to the International Diabetes Federation (IDF) report in 2021, approximately 537 million people aged 20–79 years were living with diabetes worldwide, and the prevalence continues to rise.

It is projected that the number of people with diabetes will increase to 643 million by 2030 and 783 million by 2045. More than 90% of these cases are type 2 diabetes mellitus (T2DM).[1]

In Thailand, data from the Ministry of Public Health indicate a continuously increasing trend in diabetes incidence. In 2023, approximately 300,000 new cases were reported annually. In 2022, the cumulative number of patients with diabetes was about 3.3 million, representing an increase of approximately 150,000 cases compared with 2021.[2,3]

T2DM is characterized by persistent hyperglycemia, resulting from insulin resistance combined with relative insulin deficiency.[4,5] Poor glycemic control increases the risk of both microvascular and macrovascular complications and negatively affects quality of life.[6,7]

Glycemic control is influenced by multiple factors, including sex, age, duration of diabetes, comorbidities, obesity, health behaviors (such as unhealthy dietary habits and physical inactivity), as well as psychosocial factors, including depression and diabetes-related distress.[8,9]

Diabetes-related distress (DRD) refers to emotional and behavioral changes encompassing psychosocial dimensions that arise from living with diabetes, a chronic condition requiring long-term treatment and continuous lifestyle modification. Diabetes self-management, such as dietary control, regular physical activity, and consistent medication adherence, can lead to stress, anxiety, anger, and reduced motivation. These emotional burdens may contribute to depression, poor self-management, and decreased treatment adherence.[9-12]

DRD is a common condition worldwide, with a reported prevalence ranging from 39% to 64%.[13-15] In Thailand, a study conducted in Chiang Mai reported a prevalence of 19.79%, indicating that diabetes-related distress adversely affects glycemic control. However, studies on DRD in Thailand remain limited and are mainly conducted in northern populations.[9,10] Lifestyle patterns and coping strategies may differ from those of populations in central Thailand, including Phra Nakhon Si Ayutthaya Province. Therefore, if a significant relationship between diabetes-related distress and glycemic control in patients with type 2 diabetes mellitus is confirmed, the diabetes distress scale (DDS-17) may be considered for integration into routine clinical practice to enhance the quality of diabetes care in the future.

Research objectives

Research objectives were to examine the relationship between diabetes-related distress and glycemic control among patients with T2DM receiving care at primary care units in Phra Nakhon Si Ayutthaya Province, and to identify factors affecting glycemic control among patients with T2DM attending primary care units in Phra Nakhon Si Ayutthaya Province.

METHODS

Study design

This study employed a cross-sectional study design.

Population and sample

The study population consisted of patients with T2DM who received services at primary care units in Phra Nakhon Si Ayutthaya District, Phra Nakhon Si Ayutthaya Province, between December 2024 to May 2025.

Inclusion criteria

Patients diagnosed with T2DM for at least 6 months and aged 18 years or older were included.

Exclusion criteria

Pregnant women, with history of psychiatric disorders; history of cognitive impairment; history of cancer; history of macrovascular complications related to diabetes; older adults with three or more chronic diseases, including osteoarthritis, cancer, heart failure, depression, chronic obstructive pulmonary disease, hypertension, urinary incontinence, chronic kidney disease stage 3 or higher, ischemic heart disease, and cerebrovascular disease; physical limitations that interfere with communication or participation, such as inability to speak or blindness; conditions affecting HbA1c levels, including asplenia, anemia, end-stage renal disease, hemolysis, history of erythropoietin use, or hemoglobinopathies; and individuals requiring long-term care or who are dependent on others for daily activities were excluded.[5,16]

Sample size calculation

Based on the study by Achiraya et al, the prevalence of diabetes-related distress among patients with poor glycemic control and good glycemic control was 51.4% and 6.7%, respectively.[9]

An allocation ratio of 1:1 was applied. A two-sided test was used, with a statistical power of 95% and a significance level (α) of 5%. The calculated sample size was 54 participants. To ensure data completeness, an additional 10% was added, resulting in a total sample size of 60 participants.

The participants were divided into two groups: 27 patients with uncontrolled diabetes mellitus (uncontrolled DM) and 33 patients with well-controlled diabetes mellitus (controlled DM), as shown in Figure 1.

The sample size was calculated using the following formula.

$$n = \left[\frac{z_{1-\alpha/2}\{p_0(1-p_0)\}^{1/2} + z_{1-\beta}\{p_A(1-p_A)\}^{1/2}}{p_A - p_0}\right]^2$$

Data collection

Data were collected using a structured questionnaire administered through face-to-face interviews conducted by the researcher. The questionnaire consisted of three sections as follows.

Section 1: general information

This section included demographic and clinical characteristics, such as age, sex, marital status, educational level, occupation, monthly income, perceived income adequacy, family support in diabetes care, type of diabetes treatment, duration of diabetes, alcohol consumption, smoking status, diabetes-related complications, body weight, and height.

Section 2: laboratory results

This section comprised laboratory data, including fasting blood sugar (FBS) and glycated hemoglobin (HbA1c) levels.

Section 3: diabetes-related distress assessment

Diabetes-related distress was assessed using the Thai version of the diabetes distress scale (DDS-17).[10] The scale consists of 17 items divided into four domains: emotional burden (EB), physician-related distress (PD), regimen-related distress (RD), and interpersonal distress (ID).

The mean score was calculated and participants were categorized into two groups: those with diabetes-related distress (mean DDS-17 score ≥2) and those without diabetes-related distress (mean DDS-17 score <2).

Operational definitions

Diabetes-related distress

Presence of DRD in patients with a mean DDS-17 score of ≥2, and no DRD in patients with a mean DDS-17 score of <2.

Glycemic control (diabetes control)

Uncontrolled diabetes mellitus (uncontrolled DM) in patients with an HbA1c level ≥7.0% for those aged ≤65 years, or ≥7.5% for those aged >65 years, measured on the date of DDS-17 assessment; and well-controlled diabetes mellitus (controlled DM) in patients with an HbA1c level <7.0% for those aged ≤65 years, or <7.5% for those aged >65 years, measured on the date of DDS-17 assessment.

Age

Young age for patients aged ≤65 years old and older age for patients aged ≥65 years.

Sex

Male for patients who are male and female for patients who are female.

Marital status

Married for patients currently living with a spouse, as self-reported, and living alone for patients who are single, widowed, or separated from their spouse, as self-reported.

Educational level

Below bachelor's degree for patients whose highest educational attainment is below a bachelor's degree or equivalent (including vocational education), and bachelor's degree or higher for patients whose highest educational attainment is a bachelor's degree or higher.

Employment status

Employed for patients who are currently employed, and unemployed for patients who are not currently employed.

Monthly income

Low income for patients reporting a monthly income of ≤20,000 Thai Baht, and high income for patients reporting a monthly income of >20,000 Thai Baht.

Perceived income adequacy

Adequate income for patients reporting that their current monthly income is adequate, and inadequate income for patients reporting that their current monthly income is inadequate.

Family support

No family support for patients reporting no family support in diabetes management, based on their perception, and family support present for patients reporting receiving family support in diabetes management, based on their perception.

Comorbidities

No comorbidities for patients without hypertension, dyslipidemia, or chronic kidney disease, and presence of comorbidities for patients with at least one of the following conditions: hypertension, dyslipidemia, or chronic kidney disease.

Diabetes treatment modality

Non-insulin therapy for patients not currently treated with insulin injections, and insulin therapy for patients currently receiving at least one type of insulin injection.

Diabetic microvascular complications

No complications for patients without microvascular complications of diabetes, including diabetic retinopathy (DR) or diabetic nephropathy, based on self-report or medical records, and presence of complications for patients with at least one microvascular complication of diabetes, including diabetic retinopathy (DR) or diabetic nephropathy, based on self-report or medical records.

Duration of diabetes

Short duration with duration of diabetes ≤10 years from the year of diagnosis, based on self-report, and long duration with duration of diabetes >10 years from the year of diagnosis, based on self-report.

Obesity

Non-obese for body mass index (BMI) <25 kg/m², and obese for BMI ≥25 kg/m².

Current smoking status

Non-smoker for patients denying current smoking, based on self-report, and current smoker for patients reporting current smoking, based on self-report.

Current alcohol consumption

Non-drinker for patients denying current alcohol consumption, based on self-report, and current drinker for patients reporting current alcohol consumption, based on self-report.

Fasting blood sugar (FBS)

Blood glucose level measured after fasting for at least 8 hours on the date of data collection.

Hemoglobin A1c (HbA1c)

Hemoglobin A1c level measured on the date of data collection.

Statistical analysis

Data were analyzed using STATA version 17, as follows. Descriptive statistics were used to analyze demographic and clinical characteristics. Categorical variables were presented as frequencies (n) and percentages (%).

Bivariate analysis was performed to examine factors associated with diabetes-related distress and glycemic control using the Chi-square test, independent t-test, or Mann–Whitney U test, as appropriate. Multivariable analysis was conducted using multivariable logistic regression. Statistical significance was set at a p value <0.05. Results were presented using standardized estimates (predictive margins), marginal odds ratios, and 95% confidence intervals.

Management of confounding variables

A directed acyclic graph (DAG) was constructed (Figure 2) to identify clinically relevant confounders based on literature review and clinical rationale. The identified confounders included age ≤65 years, presence of comorbidities, presence of diabetic complications, duration of diabetes >10 years, perceived inadequate income, and current smoking status.

Ethical considerations

All participants received a full explanation of the study and provided written informed consent prior to participation. Personal identifiers and identifiable information were removed to ensure confidentiality. After completion of data analysis, the data will be securely stored for one year and then destroyed.

This study was approved by the Human Research Ethics Committee of Phra Nakhon Si Ayutthaya Hospital (Project No. 0141/2567) on 28 August 2024.

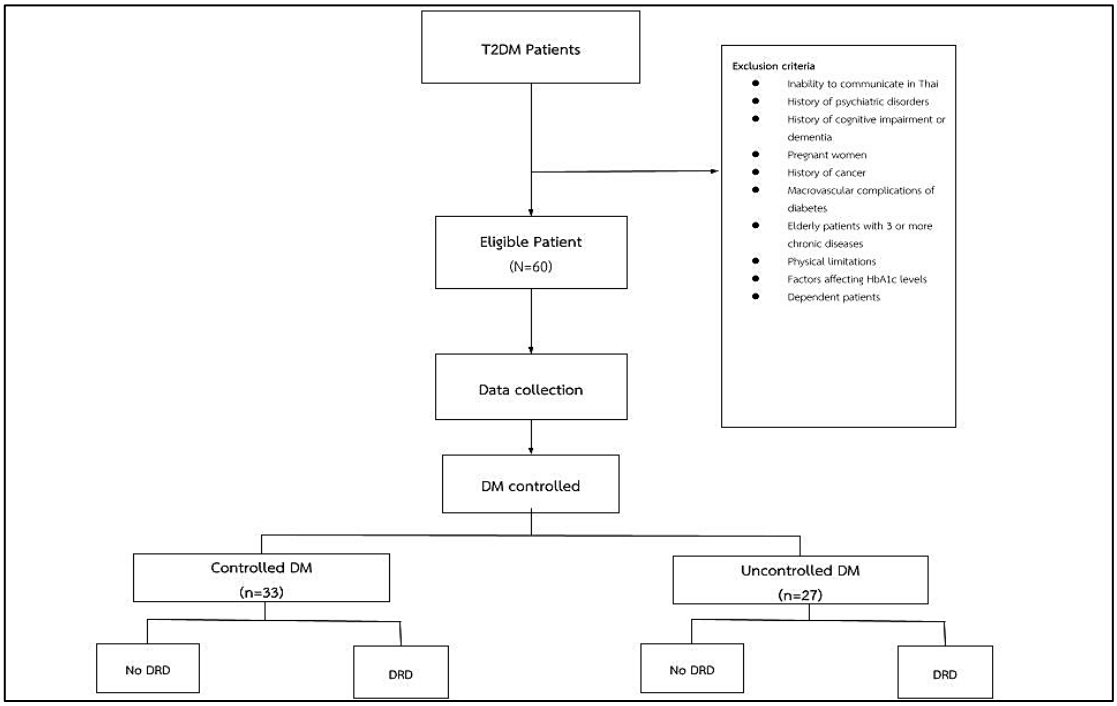

Figure 1: The presentation of the study flow.

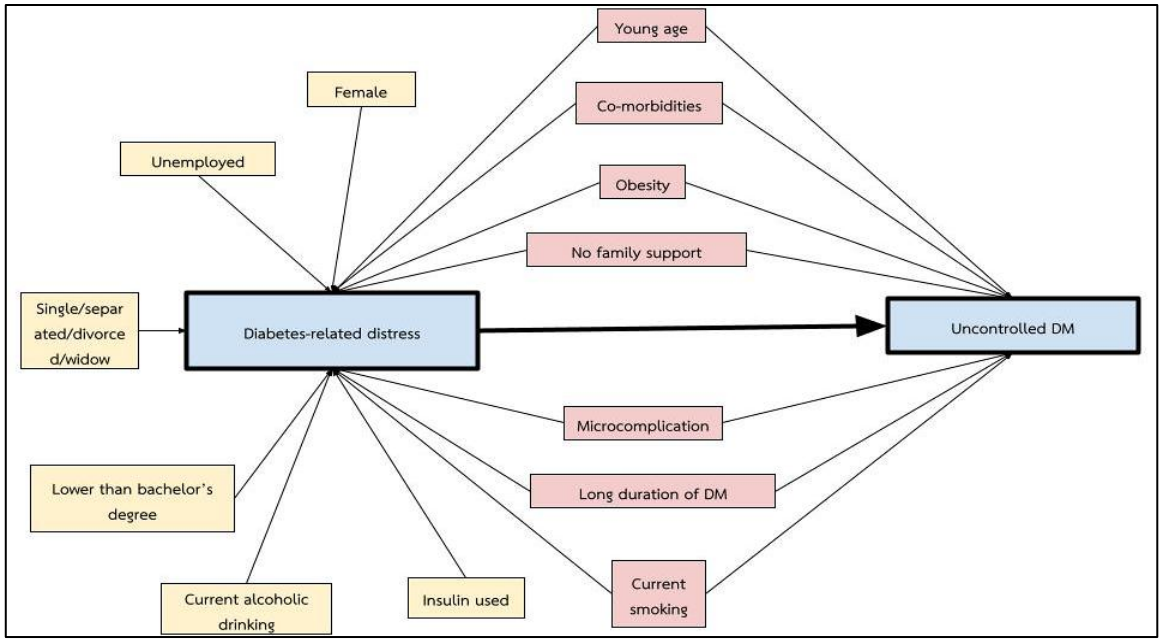

Figure 2: The presentation of DAG.

RESULTS

Demographic characteristics

A total of 60 participants were included in the study, comprising 33 patients with well-controlled diabetes and 27 patients with uncontrolled diabetes. The majority were female (75%). Participants aged ≤65 years accounted for 53.33%. Most participants had low monthly income (91.67%), and 38.33% reported that their income was inadequate. One-fifth of the participants (20%) reported no family support in diabetes care. Regarding marital status, 35% were living alone. Most participants had an educational level below a bachelor's degree (91.67%). Comorbidities were present in 93.33% of participants, and 70% were classified as obese. Current smoking was reported by 1.67% of participants. Diabetes-related complications were found in 21.67%. One-third of participants (33%) had a diabetes duration longer than 10 years, and 8.33% were receiving insulin therapy. When comparing patients with well-controlled and uncontrolled diabetes, a longer duration of diabetes and an educational level below a bachelor's degree were significantly different between the two groups (Table 1).

Association between diabetes-related distress and glycemic control

The analysis of the association between diabetes-related distress and glycemic control among patients with type 2 diabetes mellitus attending primary care units in Phra Nakhon Si Ayutthaya Province showed no significant association. The multivariable marginal odds ratio was 2.40 (95% CI: 0.36–16.21; p=0.368) (Table 2).

Factors associated with glycemic control

This study also examined factors associated with glycemic control among patients with type 2 diabetes mellitus in primary care settings. Younger age (≤65 years) and a longer duration of diabetes (>10 years) were significantly associated with poor glycemic control (Table 3).

Table 1: Demographic and clinical characteristics of the study participants.

Variables under study	Controlled diabetes		Uncontrolled diabetes		P value
	N	%	N	%	
Age (years)					
Younger age	16	48.48	16	59.26	0.405
Older age	17	51.52	11	40.74	
Sex					
Male	10	30.3	5	18.52	0.294
Female	23	69.7	22	81.48	
Marital status					
Married	22	66.67	17	62.96	
Living alone	11	33.33	10	37.04	0.765

Continued.

Variables under study	Controlled diabetes		Uncontrolled diabetes		P value
	N	%	N	%	
Educational level					
Below bachelor's degree	28	84.85	27	100	0.035
Bachelor's degree or higher	5	15.15	0	0	
Employment status					
Employed	11	33.33	14	51.85	
Unemployed	22	66.67	13	48.15	0.148
Monthly income					
Low income	30	90.91	25	92.59	0.814
High income	3	9.09	2	7.41	
Perceived income adequacy					
Perceived adequate income	20	60.61	17	62.96	
Perceived inadequate income	13	39.39	10	37.04	0.852
Family support					
No family support	6	18.18	6	22.22	0.697
Family support	27	81.82	21	77.78	
Co-morbidity					
No comorbidity	2	6.06	2	7.41	
Presence of comorbidity	31	93.94	25	92.59	0.835
Diabetes treatment modality					
Non-insulin therapy	32	96.97	23	85.19	
Insulin therapy	1	3.03	4	14.81	0.1
Diabetic complications					
No complications	26	78.79	21	77.78	0.925
Presence of complications	7	21.21	6	22.22	
Duration of diabetes					
Short duration of diabetes	26	78.79	14	51.85	
Long duration of diabetes	7	21.21	13	48.15	0.028
Obesity status					
Non-obese	8	24.24	10	37.04	
Obese	25	75.76	17	62.96	0.282
Smoking status					
Non-smoker	32	96.97	27	100	
Smoker	1	3.03	0	0	0.362
Alcohol consumption					
Non-alcohol consumption	30	90.91	24	88.89	
Alcohol consumption	3	9.09	3	11.11	0.795
Fasting blood sugar (mg/dl)	124.82±24.76		166.89±58.8		0.0004
HbA1C (%)	6.39±0.70		9.26±2.32		0
DRD					
No DRD (DDS-17 <2)	31	93.94	25	92.59	
DRD (DDS-17 ≥2)	2	6.06	2	7.41	0.835

Table 2: Association between diabetes-related distress and glycemic control among patients with type 2 diabetes mellitus attending primary care units in Phra Nakhon Si Ayutthaya Province.

Variables under study	Uncontrolled diabetes			
	Crude OR	P value	Adjusted* OR (marginal OR)	P value
Diabetes-related distress (DDS-17 ≥2)	1.24 (0.08-18.17)	1	2.40 (0.36-16.21)	0.368

*Adjusted for potential confounders, including age ≤65 years, presence of comorbidities, presence of diabetic complications, duration of diabetes >10 years, perceived inadequate income, and current smoking status

Table 3: Factors associated with glycemic control among patients with type 2 diabetes mellitus attending primary care units in Phra Nakhon Si Ayutthaya Province.

Variables under study	Uncontrolled diabetes			
	Crude OR	P value	Adjusted OR (marginal OR)	P value
Age (years)				
Younger age	1.55 (0.49-4.91)	0.406	2.88 (1.04-7.97)	0.041*
Sex				
Female	1.91 (0.56-6.49)	0.298	2.12 (0.67-6.73)	0.203
Marital status				
Living alone	1.18 (0.41-3.41)	0.765	1.09 (0.38-3.14)	0.876
Occupation				
Unemployed	0.46 (0.16-1.32)	0.15	0.41 (0.15-1.13)	0.084
Perceived income adequacy				
Perceived income inadequacy	0.90 (0.32-2.58)	0.852	0.62 (0.22-1.77)	0.377
Family support				
No family support	1.29 (0.36-4.57)	0.697	1.62 (0.44-6.05)	0.471
Co-morbidity				
Comorbidity	0.81 (0.11-6.14)	0.835	0.65 (0.11-3.78)	0.628
Complications of diabetes				
Presence of complications	1.06 (0.31-3.64)	0.925	1.90 (0.54-6.68)	0.315
Duration of diabetes				
Prolonged duration of diabetes	3.45 (1.12-10.63)	0.031*	5.88 (1.93-17.93)	0.002*
Obesity				
Obese	0.54 (0.18-1.66)	0.285	0.42 (0.15-1.17)	0.098
Smoking				
Smoker	1.25 (0.23-6.76)	0.796	0.65 (0.12-3.34)	0.602

*P<0.05

DISCUSSION

Primary outcome

This study examined the association between DRD and glycemic control among patients with type 2 diabetes mellitus attending primary care units in Phra Nakhon Si Ayutthaya Province. The results showed no significant association between diabetes-related distress and glycemic control (multivariable marginal OR 2.40; 95% CI: 0.36–16.21; p=0.368). This finding is consistent with several previous studies, although conflicting evidence has also been reported.[9-12]

A meta-analysis by Mirghani et al, which reviewed 22 studies, demonstrated a significant association between DRD and poor glycemic control, with an odds ratio of 0.42 (95% CI: 0.17–0.67; p<0.0001), suggesting that DRD was associated with a 58% lower risk of poor glycemic control.[18] These findings highlight the complex relationship between psychosocial factors, such as DRD, and glycemic control, which is commonly assessed using HbA1c—a multifactorial metabolic outcome.[19]

Additionally, some patients with diabetes may intentionally avoid strict self-management despite having elevated blood glucose levels, particularly due to fear of hypoglycemia. This behavior may result in lower perceived DRD despite poor glycemic control.[20] This suggests that diabetes-related distress and glycemic control do not always demonstrate a linear or directly proportional relationship.

In contrast, a systematic review by Wibowo et al, which included 17 studies, reported a weak positive correlation between DRD and HbA1c levels, with correlation coefficients ranging from 0.15 to 0.26, indicating a modest association in the same direction.[21] Furthermore, a sub-study by Andrea et al of the GRADE study found that among patients with a shorter duration of diabetes (<10 years), DRD was not associated with glycemic control.[22,23] This suggests that DRD may not be a reliable predictor of HbA1c over time, particularly in patients with a relatively short disease duration.

This finding is consistent with the present study, in which 67% of participants had a diabetes duration of less than 10 years. In such patients, residual pancreatic beta-cell function may still be preserved, contributing to better glycemic regulation independent of psychosocial distress. Moreover, family support has been shown to mitigate DRD, even among patients with poor glycemic control, a phenomenon reported more frequently in Asian populations than in other regions.[24]

Treatment modality also plays a role. Insulin therapy, in particular, increases treatment burden and has been associated with higher levels of DRD, especially in the

regimen-related distress (RD) domain, even among patients with lower HbA1c levels.[25] Another contributing factor may be the definition of glycemic control used in this study, which differs from many previous Thai studies that commonly used a uniform HbA1c cutoff of 7%.[7-9] In contrast, this study applied age-specific HbA1c targets, which may have influenced the observed associations.

Finally, the prevalence of diabetes-related distress in this study was relatively low (6.67%) compared with the study by Chew et al, which reported a prevalence of 49.2%, as well as several previous studies.[7-9,26] The small sample size and low prevalence of DRD may have limited the statistical power to detect a significant association between DRD and glycemic control.

Secondary outcome

This study also examined factors associated with glycemic control among patients with type 2 diabetes mellitus attending primary care units in Phra Nakhon Si Ayutthaya Province. The results demonstrated that patients aged ≤65 years and those with a longer duration of diabetes (>10 years) were significantly associated with poor glycemic control.

These findings are consistent with the study by Patcharin et al, which reported that younger patients with diabetes—particularly those aged under 60 years—had a 2.95-fold higher risk of poor glycemic control compared with older adults.[27] The results are also in line with findings from the National Health and Nutrition Examination Survey (NHANES), which examined age at diagnosis and glycemic outcomes.[28] Patients diagnosed with diabetes between the ages of 30 and 65 years were found to have poorer HbA1c levels than those diagnosed after the age of 65 years.[29]

Younger patients often face challenges in diabetes self-care due to work-related responsibilities, limited time for physical activity, and unhealthy dietary behaviors, such as frequent consumption of fast food or high-energy meals during busy working hours. These factors contribute to poorer glycemic control. In contrast, older adults, particularly those who are retired, tend to have more time for self-care and greater attention to health-related behaviors.[30]

Another important factor identified in this study was the duration of diabetes. This finding is consistent with the systematic review and meta-analysis conducted by Abere et al, which demonstrated that patients with a longer duration of diabetes (7–10 years or more) had a significantly higher risk of poor glycemic control.[31] In particular, patients with a diabetes duration of more than 10 years had a 2.57-fold increased risk of poor glycemic control compared with those with a shorter disease duration (adjusted OR=2.57; 95% CI: 1.65–3.49; p<0.001).[32]

Strengths of the study

This study assessed the association between diabetes-related distress and glycemic control using marginal odds ratios, with adjustment for potential confounders guided by a DAG. It provides evidence on DRD and poor glycemic control in central Thailand, where previous studies have been limited.

Limitations

The sample size was relatively small compared with previous studies, resulting in a low prevalence of DRD and a limited number of clinical events, which may have reduced the statistical power of the analysis.

The cross-sectional study design limits causal inference. Clinical variables, including DRD and HbA1c levels, can vary over time, which may lead to discrepancies between the observed associations and the true relationships.

CONCLUSION

In conclusion, this study demonstrates no statistically significant association between DRD and glycemic control among patients with type 2 diabetes in the primary care settings of Phra Nakhon Si Ayutthaya. Despite a relatively low prevalence of DRD (6.67%) in this cohort, younger age (≤65 years) and a disease duration exceeding 10 years were identified as significant independent predictors of suboptimal glycemic control. These findings underscore the necessity for primary care physicians to prioritize targeted metabolic interventions and intensive monitoring for younger patients and those with long-standing diabetes to effectively mitigate the risk of chronic complications.

Recommendations

Future studies should collect and analyze DRD by individual domains to better understand specific psychosocial dimensions.

Longitudinal study designs should be considered to allow follow-up and comparison across different time points.

Increasing the sample size would improve statistical power and the generalizability of findings.

Additional clinical and contextual variables, such as social environment and neighborhood factors, should be included, as these may influence DRD and glycemic control.

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