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Cross-sectional Study

Diabetes distress and associated factors in type 2 diabetes at an Indonesian hospital: A cross-sectional study

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ABSTRACT

This study aims to determine the prevalence of diabetes stress among adults with type 2 diabetes mellitus (T2DM) and identify associated sociodemographic, behavioural, and clinical factors. A cross-sectional study was conducted from February to April 2025 among 144 patients with T2DM attending the endocrinology outpatient clinic of Ulin Regional General Hospital, Banjarmasin, Indonesia. Sociodemographic data were collected using a structured questionnaire. Diabetes distress was measured using the Diabetes Distress Scale (DDS-17). Diabetes knowledge, medication knowledge, and medication adherence were assessed using DKQ-24, DMKQ, and ARMS, respectively. Glycemic control was obtained from laboratory records. Factors associated with diabetes distress were analyzed using the chi-square or Mann-Whitney test and multivariable binary logistic regression. Overall, 72.9% of participants experienced moderate to high diabetes distress, with emotional burden and regimen distress as the dominant domains. Medication non-adherence and uncontrolled blood glucose showed the strongest associations with diabetes distress ($p<0.001$). Diabetes distress was also significantly associated with the presence of complications, use of combination therapy, and lower levels of diabetes and medication knowledge. These findings highlight the importance of routine screening for diabetes distress and comprehensive pharmaceutical care, which should be integrated into standard diabetes management to improve patient-centered care and long-term clinical outcomes.

Keywords: Diabetes distress, Medication adherence, Glycemic control, Prevalence, Indonesia

Introduction

Diabetes Mellitus (DM) is a group of carbohydrate metabolism disorders in which inappropriate gluconeogenesis and glycogenolysis produce excessive glucose, leading to hyperglycemia [1]. Globally, the prevalence of diabetes continues to increase. In 2024, it was reported that the number of adults with diabetes worldwide was 11.1%, and this figure is projected to increase to 13.0% by 2050. Indonesia ranks fifth out of 10 countries with the highest number of people living with diabetes, with 20.4 million people [2].

Integrating self-care in type 2 diabetes mellitus (T2DM) patients, such as doing regular physical activity, implementing a healthy diet, monitoring blood glucose levels, and taking diabetes medication in daily life requires a lot of time and effort, so that diabetes distress (DD) is common in DM patients. The prevalence of DD in T2DM patients is reported to be more than 60% [1]. In Indonesia, the prevalence of DD is 39.5% (moderate category) and 13.95% (high category) [3]. DD refers to the emotional burden and worry experienced by DM patients regarding the management of their disease [1, 4]. DD is of clinical concern due to its high prevalence and clinically significant association with disease management, medication adherence and glycemic control [5-8]. The risk of DD increases in patients with uncontrolled T2DM, who experience complications and receive complex treatment regimens [6]. In addition, low education levels, younger age, longer duration of diabetes, comorbidities,

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lack of physical activity, unhealthy diet, and poor self-care behavior are also factors that can increase the risk of DD [9-12]. A review of studies on distress and its factors among T2DM patients in Indonesia is still limited [13, 14]. This study aimed to assess DD and its associated factors in T2DM patients in South Kalimantan, Indonesia. Assessment of DD and its associated determinants is essential for healthcare professionals to develop tailored interventions for T2DM patients.

Materials and Methods

Study design and participants

A cross-sectional study was conducted at the patients with type 2 diabetes mellitus at the Endocrinology Polyclinic of Ulin Regional General Hospital, Banjarmasin, a tertiary referral hospital in Kalimantan, from February to April 2025. Inclusion criteria included outpatients aged 21–65 years, diagnosed with T2DM for at least six months, undergoing antidiabetic therapy (either monotherapy or combination), and able to read, write, and communicate well. Exclusion criteria included pregnant patients, patients with severe physical or mental disorders, and patients who refused to participate in the study. The minimum sample size was determined using the Slovin formula for a finite population. Based on a total eligible population of 192 patients and a 5% margin of error, the minimum sample size required was calculated as 130 participants. Allowing for a 10% non-response rate, 144 participants were enrolled. Consecutive sampling was used, meaning that every eligible patient was recruited until the target was met.

Measurements

- A series of structured questions was administered to obtain data on the respondents' socio-demographic characteristics, including age, gender, education level, marital status, type of employment, family history of diabetes, duration of diabetes, presence of diabetes complications, type of drug therapy used (single or in combination), and smoking habits.
- Diabetes distress was assessed using the Indonesian version of the Diabetes Distress Scale (DDS-17), for which permission for use had been obtained [15]. The instrument consists of 17 items rated on a six-point Likert scale. The DDS-17 evaluates distress across four domains: emotional burden, physician distress, regimen distress, and interpersonal distress. Scores lower than 2 were interpreted as minimal or no distress, while values of 2 and above were classified as moderate to high distress [10, 16, 17]. In the present study, the DDS-17 demonstrated excellent internal reliability, with a Cronbach's alpha value of 0.927.
- Diabetes-related knowledge was assessed using the Diabetes Knowledge Questionnaire (DKQ-24), comprising 24 questions with three possible responses: "yes," "no," and "do not know." A score of 1 was assigned for each correct response, whereas incorrect and "do not know" answers received a score of 0. Based on the total score, knowledge levels were categorized as high (17–24), moderate (10–16), and low (0–9) [18-21]. In this study, the Indonesian version of the DKQ-24 showed excellent reliability, with a Cronbach's alpha coefficient of 0.926.
- Knowledge of diabetes medication was assessed using the Diabetes Medication Knowledge Questionnaire (DMKQ). The original instrument [22, 23] was translated into Indonesian using a standardized forward–backward translation procedure. Permission to use the instrument was obtained from the original authors. Two bilingual translators independently conducted the forward translation, followed by reconciliation. The back-translation was conducted by a native English speaker and subsequently compared with the original instrument to confirm conceptual consistency. The finalized Indonesian version was pilot-tested among 30 patients with T2DM and demonstrated acceptable reliability (Cronbach's alpha = 0.722). The Diabetes Medication Knowledge Questionnaire (DMKQ) consists of five questions. The first and fifth questions are rated using a binary scoring system (0 or 1), while the second through fourth questions are evaluated on a three-level scale (0, 1, or 2) for each answer. The overall medication knowledge score was calculated by adding the individual item scores, producing a possible total score between 0 and 8. For analytical purposes, medication knowledge was categorized into two levels using the median score of 5 as the cut-off, with scores <5 indicating low knowledge and scores ≥ 5 indicating high knowledge [24, 25].
- Medication adherence was assessed using the Indonesian adaptation of the Adherence to Refills and Medications Scale (ARMS), for which formal permission was obtained from the original authors. The ARMS includes 12 statements scored on a four-point Likert scale, generating a total score range of 12–48, where lower scores represent higher levels of adherence. In the present study, the questionnaire exhibited excellent internal consistency, with a Cronbach's alpha value of 0.938. Adherence was categorized dichotomously using a cut-off value of 12, where a score of 12 indicated optimal adherence and scores >12 indicated non-adherence [26-29]. This cut-off was selected based on the conceptual framework of the ARMS, whereby the minimum score reflects complete adherence, and any increase indicates the presence of non-adherent behavior, allowing for meaningful clinical interpretation and statistical modeling using binary outcomes [30-33].
- Glycemic control was assessed using glycated hemoglobin (HbA1c) values obtained from laboratory records. Clinical outcomes were classified as controlled (HbA1c $<7\%$) or uncontrolled (HbA1c $\geq 7\%$), in accordance with established clinical guidelines [34-36].

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 29 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize socio-demographic characteristics as well as

behavioral and clinical variables. The normality of continuous variables was assessed using the Kolmogorov–Smirnov test and Q–Q plots. Categorical variables are presented as frequencies and percentages, while non-normally distributed continuous variables are reported as medians with interquartile ranges (IQR). Bivariate analysis was conducted using two complementary approaches to ensure a comprehensive evaluation of associations. Pearson's chi-square test or Fisher's exact test was applied to examine relationships between categorical variables. The Mann–Whitney U test was used to compare median values between groups for continuous variables. A two-tailed p-value <0.05 was considered statistically significant. Variables with p-values <0.25 in bivariate analysis were subsequently included in a multivariable binary logistic regression model to identify factors independently associated with diabetes distress. The results are presented as adjusted odds ratios (aOR) with 95% confidence intervals (CI), and statistical significance was set at p <0.05.

Results and Discussion

This study provides a comprehensive overview of the prevalence of diabetes distress (DD) and its associated factors among patients with type 2 diabetes mellitus (T2DM) receiving care at a tertiary referral hospital in Kalimantan, Indonesia. A total of 144 participants were recruited. Most were aged 46–55 years (56.9%), with an almost equal distribution of female and male (52.1% vs. 47.9%). Consistent with previous reports indicating comparable proportions of T2DM between male and female (44.3% vs. 55.7%) [37-39]. In line with reports from the International Diabetes Federation, diabetes prevalence was also similar between men and women aged 20–79 years and increased with advancing age, as reflected in the present findings [2, 40, 41]. The majority of respondents were married (81.9%), housewives (39.6%), and had completed high school (40.3%). More than half had a family history of diabetes (54.9%), disease duration of 5–10 years (75.7%), received combination therapy (63.9%), had two complications (55.6%), and were non-smokers (79.2%). Knowledge about diabetes was mostly moderate to low (39.6%; 34.7%), while knowledge about treatment was predominantly low (65.3%) **(Table 1)**. Previous research findings show that knowledge about diabetes is correlated with diabetes distress [42].

Table 1. Characteristics of the study participants (n=144)

Characteristics	Category	Frequency	Percentage
Sex	Male	69	47.9
	Female	75	52.1
Age (years)	36-45	23	16.0
	46-55	82	56.9
	56-65	39	27.1
Educational level	Elementary school	26	18.1
	Junior high school	20	13.8
	Senior high school	58	40.3
	University	40	27.8
Marital status	Married	118	81.9
	Divorced/widowed	26	18.1
Occupation	Housewife	57	39.6
	Employee	47	32.6
	Self-employed	40	27.8
Family history of diabetes	No	65	45.1
	Yes	79	54.9
Duration of diabetes (years)	<5	35	24.3
	5-10	109	75.7
Diabetes complications	One complication	46	31.9
	Two complication	80	55.6
	Three/more complications	18	12.5
Diabetes medication regimen	Single	52	36.1
	Combination	92	63.9
Smoking status	No	114	79.2
	Yes	30	20.8
Knowledge of diabetes, Median (IQR)		12.0 (7.0-17.0)	
	High	37	25.7
	Moderate	57	39.6
	Low	50	34.7

Medication Knowledge of diabetes, Median (IQR)		4.0 (3.0-5.0)	
	High	50	34.7
	Low	94	65.3
Total distress, Median (IQR)		2.3 (1.8-3.1)	
	Low to no	39	27.1
	Moderate to high	105	72.9
Emotional burden, Median (IQR)		2.6 (1.8-3.6)	
	Low to no	39	27.1
	Moderate to high	105	72.9
Physician distress, Median (IQR)		1.5 (1.1-2.0)	
	Low to no	104	72.2
	Moderate to high	40	27.8
Regimen distress, Median (IQR)		2.8 (2.0-3.8)	
	Low to no	32	22.2
	Moderate to high	112	77.8
Interpersonal distress, Median (IQR)		1.7 (1.0-2.3)	
	Low to no	76	52.8
	Moderate to high	68	47.2
Medication adherence, Median (IQR)		16.5 (12.0-28.0)	
	Adherent	51	35.4
	Non-adherent	93	64.6
HbA1c, Median (IQR)		8.2 (6.9-9.7)	
	Controlled	39	27.1
	Uncontrolled	105	72.9

In total, 72.9% of respondents experienced diabetes distress (moderate–high), with a median total DD score of 2.3 (IQR 1.8–3.1) **(Table 1)**. This prevalence aligns with the American Diabetes Association's report that more than 60% of patients with T2DM experience diabetes-related distress [1, 43]. Comparable findings have been reported in previous studies documenting a DD prevalence of 38.2% [44, 45] and in a meta-analysis demonstrating wide variability in prevalence, ranging from 8.45% to 61.48% [46, 47]. Several studies have shown that higher DD is more frequently observed among patients treated in tertiary care settings, those with greater complication burden, longer disease duration, and poorer glycemic control [46, 48]. Treatment regimen complexity further contributes to increased emotional burden, and multiple investigations have consistently reported strong associations between uncontrolled HbA1c, use of combination therapy, presence of multiple complications, and elevated diabetes distress [49, 50]. Longitudinal evidence also indicates that higher DD is associated with poorer medication adherence over time, with individuals experiencing severe distress reporting greater difficulty maintaining their treatment regimens compared with those experiencing lower distress. Collectively, these findings underscore the importance of integrating routine DD screening into comprehensive diabetes management to facilitate early identification of patients who may benefit from targeted psychosocial support and self-management interventions [7, 51].

Based on **Table 1**, Subscale analysis revealed that emotional burden and regimen distress were the most dominant components of DD (median 2.8 (IQR 2.0–3.8) and 2.6 (IQR 1.8–3.6), respectively), whereas physician and interpersonal distress were relatively lower. This pattern is consistent with prior research demonstrating that emotional burden typically yields the highest subscale scores, followed by regimen distress, while physician distress tends to be the lowest [9]. Regimen complexity is known to be associated with lower adherence and suboptimal glycemic control and frequently co-occurs with higher stress levels [9, 10]. Patients with poor glycemic control and multiple complications generally face greater pharmacotherapy burden, which complicates treatment management and is associated with higher DD [52, 53]. Emotional burden occupies a central role in the psychological experience of individuals with T2DM, as the persistent demands of self-management and concerns regarding disease complications substantially contribute to emotional strain that adversely affects quality of life and self-care capacity. Existing literature indicates that emotional burden is associated with poorer clinical outcomes, including suboptimal self-care and elevated HbA1c, whereas emotionally supportive interventions such as counselling and psychosocial care are associated with improvements in DD and self-management, including medication adherence [54, 55]. In contrast, physician-related and interpersonal distress were relatively low. This finding aligns with evidence suggesting that better physician communication and higher levels of patient trust in healthcare providers are associated with lower stress in these subdomains [9, 56]. Social support from family and community has also been reported to be associated with lower DD among individuals with T2DM [48, 57]. Accordingly, intervention strategies that prioritize reducing regimen burden and emotional distress, while maintaining high-quality clinical communication and strengthening social support, are particularly relevant in this population.

Non-adherence to treatment was found in 64.6% of respondents, and 72.9% had uncontrolled HbA1c levels **(Table 1)**. The majority of participants demonstrated medication non-adherence and suboptimal glycemic control. Medication adherence is a key determinant of effective diabetes management and is closely associated with disease progression and long-term clinical outcomes [58]. Numerous studies have reported that higher DD

is associated with impaired self-care behaviours, poorer medication adherence, worse glycemic control, and negative emotional states such as anxiety, fatigue, and feelings of hopelessness [7].

Bivariate analysis showed a significant association between disease complications (p=0.029), therapy regimen (p=0.021), knowledge of diabetes, medication adherence, and glycemic control (all p<0.001) with diabetes distress **(Table 2)**. Patients with complications exhibited a higher prevalence of DD than those without complications, a pattern consistently reported in previous studies [42, 59, 60]. Higher distress levels were also observed among patients with two or more complications and among those receiving combination therapy compared with monotherapy, reflecting increasing clinical burden and treatment complexity [50, 51, 61]. Lower patient knowledge was significantly associated with higher DD, consistent with evidence that better diabetes knowledge is linked to lower distress, potentially hrough enhanced disease management competence [42].

Table 2. Association of socio-demographic, behavioral, and clinical factors with diabetes distress (n=144)

Variables	Category	Diabetes distress		p-value
		Low to no distress n (%)	Moderate to high distress n (%)	
Sex	**Male**	22 (29.3)	53 (70.7)	0.526
	Female	17 (24.6)	52 (75.4)	
Age (years)	**36-45**	8 (34.8)	15 (65.2)	0.281
	46-55	24 (29.3)	58 (70.7)	
	56-65	7 (17.9)	32 (82.1)	
Educational level	**Elementary school**	3 (11.5)	23 (88.5)	0.110
	Junior high school	4 (20.0)	16 (80.0)	
	Senior high school	17 (29.3)	41 (70.7)	
	University	15 (37.5)	25 (62.5)	
Marital status	**Married**	29 (24.6)	89 (75.4)	0.349
	Divorced/widowed	10 (38.5)	16 (61.5)	
Occupation	**Housewife**	11 (19.3)	46 (80.7)	0.077
	Employee	18 (38.3)	29 (61.7)	
	Self-employed	10 (25.0)	30 (75.0)	
Family history of diabetes	**No**	21 (32.3)	44 (67.7)	0.240
	Yes	18 (22.8)	61 (77.2)	
Duration of diabetes (years)	**<5**	13 (37.1)	22 (62.9)	0.124
	5-10	26 (23.9)	83 (76.1)	
Diabetes complications	**One complication**	19 (41.3)	27 (58.7)	0.029
	Two complication	17 (21.2)	63 (78.8)	
	Three/more complications	3 (16.7)	15 (83.3)	
Diabetes medication regimen	**Single**	20 (38.5)	32 (61.5)	0.021
	Combination	19 (20.7)	73 (79.3)	
Smoking status	**No**	34 (29.8)	80 (70.2)	0.319
	Yes	5 (16.7)	25 (83.3)	
Knowledge of diabetes	**High**	24 (64.9)	13 (35.1)	< 0.001
	Moderate	6 (10.5)	51 (89.5)	
	Low	9 (18.0)	41 (82.0)	
	Median (IQR)	17.0 (12.0-18.0)	11.0 (7.0-14.0)	<0.001*
Medication Knowledge of diabetes	**High**	26 (52.0)	24 (48.0)	< 0.001
	Low	13 (13.8)	81 (86.2)	
	Median (IQR)	5.0 (4.0-6.0)	4.0 (3.0-4.0)	< 0.001*
Medication adherence	**Adherent**	32 (62.7)	19 (37.3)	<0.001
	Non-adherent	7 (7.5)	86 (92.5)	
	Median (IQR)	12.0 (12.0-12.0)	21.0 (14.0-29.0)	<0.001*
HbA1c	**Controlled**	27 (69.2)	12 (30.8)	<0.001
	Uncontrolled	12 (11.4)	93 (88.6)	
	Median (IQR)	6.4 (6.1-6.8)	8.9 (8.1-10.6)	<0.001*

Note: n, number of subjects. Categorical variables are presented as n (%); numerical variables are presented as median (interquartile range). Analyzed using Pearson's Chi-square test. *Analyzed using the Mann-Whitney U test.

Multivariable logistic regression analysis showed that diabetes distress was associated with higher odds in patients with two complications (aOR 1.73; 95% CI 1.11–2.74; p=0.040), three or more complications (aOR 1.90; 95% CI 1.05–3.49; p=0.023), combination therapy (aOR 1.75; 95% CI 1.05–2.94; p=0.033), low diabetes knowledge (aOR 1.62; 95% CI 1.02–2.78; p=0.041), low medication knowledge (aOR 1.83; 95% CI 1.16–3.23; p=0.012), medication non-adherence (aOR 3.09; 95% CI 1.74–5.39; p<0.001), and poor glycemic control. (aOR 2.73; 95% CI 1.75– 4.39; p<0.001) **(Table 3).**

Table 3. Multivariable analysis: binary logistic regression of factors associated with diabetes distress

Variables	aOR	95%CI	p-value
Occupation			
Housewife	1 (ref)		
Employee	1.484	0.684-3.394	0.385
Self-employed	1.328	0.504-3.972	0.597
Family history of diabetes			
No	1 (ref)		
Yes	1.543	0.884-2.604	0.118
Duration of diabetes (years)			
<5	1 (ref)		
5-10	1.364	0.949-2.177	0.169
Diabetes complications			
One complication	1 (ref)		
Two complication	1.728	1.105-2.740	0.040
Three/more complications	1.901	1.051-3.492	0.023
Diabetes medication regimen			
Single	1 (ref)		
Combination	1.752	1.049-2.936	0.033
Knowledge of diabetes			
High	1 (ref)		
Moderate	1.450	1.020-2.380	0.044
Low	1.620	1.020-2.780	0.041
Medication Knowledge of diabetes			
High	1 (ref)		
Low	1.829	1.162-3.226	0.012
Medication adherence			
Adherent	1 (ref)		
Non-adherent	3.089	1.739-5.385	< 0.001
HbA1c			
Controlled	1 (ref)		
Uncontrolled	2.730	1.750-4.390	< 0.001

Medication adherence and glycemic control (HbA1c) emerged as the strongest independent correlates of DD in the multivariable analysis. These findings are consistent with previous literature demonstrating that lower emotional distress is associated with better glycemic control, whereas poorer glycemic profiles commonly co-occur with higher levels of distress [62]. Longitudinal studies further indicate that patients' perceptions of worsening glycemic control is associated with increased emotional distress at subsequent clinical visits [63].

No significant differences in DD were observed according to sex, age, marital status, or smoking status. This suggests that DD in this population is more closely related to clinical, behavioural, and knowledge-related factors than to basic socio-demographic characteristics. These findings reinforce the importance of adopting a holistic approach to diabetes care that integrates patient education, pharmacist-led counselling, and strengthened social support as core components of comprehensive diabetes management [51].

Conclusion

The results highlight that DD is highly prevalent among patients with T2DM in Kalimantan, with medication adherence and glycemic control representing the strongest correlates of distress. Although causal relationships cannot be inferred from this cross-sectional design, the findings support the need for routine DD screening and the integration of educational and psychosocial support within pharmaceutical care to enhance patient-centered diabetes management and make it part of comprehensive diabetes care. Future studies should use multi-center longitudinal designs with probability sampling to strengthen the evidence base and clarify the direction of relationships among key variables.

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Conflict of interest: None

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