

# Factors Associated with Diabetes-Related Distress in Type 2 Diabetes Mellitus Patients

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**Background:** Diabetes-related distress is a unique emotional problem that is directly related to the burden and anxieties felt by type 2 diabetes mellitus (T2DM) patients. Diabetes-related distress may lead to pessimism and lower self-efficacy which resulted in a deficiency of self-treatment compliance and can cause further bad glycemic control. Knowing the associated factors of diabetic-related distress and solving them may help T2DM patients improve their glycemic control.

**Methods:** This study is an analytical study with cross-sectional design conducted at Sanglah General Hospital from January to April 2021. The data were taken using the consecutive sampling method; 124 samples were collected according to inclusion and exclusion criteria. The participants filled Diabetes Distress Scale questionnaire (DDS17 Bahasa Indonesia). The data analysis was done using univariate (descriptive), bivariate (chi-square) and multivariate (logistic regression) analysis.

**Results:** Seventy-five subjects out of 124 (60.5%) had diabetes-related distress. The associated factors of diabetes-related distress one among others are the insulin usage as diabetic therapy (OR= 8.30, 95% CI 2.24–30.72;  $p = 0.002$ ), had a hypoglycaemia in last 3 months (OR=44.59, 95% CI 4.36–455.51;  $p = 0.001$ ), had diabetes-related retinopathy (OR=10.28, CI 95% 1.54–68.70;  $p=0.016$ ), and lack of family support (OR=44.791, 95% CI 10.02–200.22;  $p < 0.001$ ).

**Conclusion:** Our present study revealed that diabetes distress prevalence is predominantly and associated among in type 2 diabetes mellitus. We suggest diabetes-related distress screening and regular health promotion which focus on relationship between diabetes and psychological may be a great potential action to improve public health and patient outcomes.

**Keywords:** type 2 diabetes mellitus, diabetes-related distress, factors associated

## Introduction

Type 2 diabetes mellitus (T2DM) is currently a global health threat. WHO predicts an increase in the number of people with T2DM in Indonesia from 8.4 million in 2000 to around 21.3 million in 2030.<sup>1</sup> Besides the physical impact, T2DM can also have a psychological impact on the patient. The psychological impact of T2DM begins to be felt from the time it is diagnosed and lasts for several months or even more than 1 year.<sup>2</sup> The most frequent psychological impacts found in patients with T2DM are distress and depression.<sup>3</sup>

Diabetes-related distress is a unique emotional problem that is directly related to the burdens and worries of living with T2DM.<sup>4</sup> The prevalence of diabetes-related distress is quite high. In primary health care facilities, the prevalence of diabetes-related distress varies between 19% and 35%, while in secondary and tertiary health care facilities varies between 8.8% and 43%.<sup>5</sup> The emotional sub-scale of diabetes-related distress can be divided into four types: (1) emotional burden (the patients feel anger, fear, and depression when thinking about their diabetes), (2) physician-related distress (the patients feel that health workers do not understand their current condition and set unrealistic targets for therapy related to their diabetes), (3) regimen-related distress (the patients feel unable and unconfident in doing therapy

or self-care related to their diabetes), and (4) interpersonal distress (the patients assume that their family or caretaker cannot support their therapy and understand the difficulties of living with diabetes).<sup>6</sup> Several factors that are known have related to diabetes distress include gender, age, education level, marital status, physical activity, economical status, patient's knowledge about diabetes, healthy lifestyle, obesity, duration of diabetes, diabetes therapy regiment, incidence of hypoglycemia, chronic complication, glycemic control, and family support. Recent research shows bidirectional association between DM outcomes and diabetes distress. Unfortunately, this case recently undetected and unreported wither clinicians or patients, leading to inadequate treatment of psychological disorders. This condition may affect poor glycaemic control and increased morbidity and mortality in diabetes patients in the long term.<sup>7</sup>

The American Diabetes Association recommends physicians assess the possibility of diabetes-related distress, especially in T2DM patients who have not achieved the glycemic control target though they have received adequate therapy and have chronic complications related to type 2 DM.<sup>8,9</sup> One of the instruments used to assess diabetes-related distress is Diabetes Distress Scale (DDS17) questionnaire. This instrument consists of 17 statements that contain potential problems in T2DM patients that can cause distress and includes four emotional subscales of diabetes-related distress.<sup>10</sup> This instrument has been world widely used to assess diabetes-related distress and has been translated into the Indonesian language.

Good glycemic control is one of the therapeutic targets for T2DM patients to prevent various complications. Diabetes-related distress can cause pessimism, lower self-efficacy, and a decrease in adherence to treatment and self-care, which further results in poor glycemic control.<sup>10,11</sup> A study by Fisher et al showed that diabetes-related distress was significantly correlated with self-care and glycemic control. Patients who received education related to diabetes-related distress showed improvement in HbA1c levels in 3 months.<sup>12</sup>

The main purpose of this study was to find out what factors were associated with diabetes-related distress in T2DM patients, with the hope that health care providers can recognise it earlier and prevent it so that glycemic control can be achieved properly. These findings are expected to provide input for health workers to identify factors related to diabetes-related distress and control them, so that better glycemic control can be achieved.

## Methods

### Study Design and Population Selection

A cross-sectional study design with participants was recruited from T2DM patients who visited the Diabetes Clinic of Sanglah General Hospital, Denpasar, between January and April 2021 with consecutive sampling technique. Inclusion criteria were all T2DM patients over the age of 18 years, ongoing treatment of diabetes for at least 3 months, cooperative, and willing to sign an informed consent. Exclusion criteria were T2DM patients with pregnancy, patients with impaired cognitive function (dementia, Alzheimer's disease, or psychosis), a history of cancer, had physical limitations (blindness, deafness, and aphasia), and could neither read nor speak Indonesian well.

Demographic and clinical data of respondents such as gender, age, education level, marital status, physical activity, education, duration of diabetes, diabetes therapy regimen used in the last 3 months, and incidence of hypoglycaemia and chronic complication was diagnosed based on anamnesis, physical examination and laboratory findings recorded based on ICD-10 in the last 3 months. Diabetic retinopathy, diabetes-associated coronary arterial disease, diabetes-associated ischemic or haemorrhagic stroke, diabetic foot, and diabetic nephropathy were included in these criteria.

### Instrument

Data on diabetes-related distress were collected using the Diabetes Distress Scale (DDS17) questionnaire in Indonesian, which had been tested for validity ( $r = 0.98$ ) and reliability (Cronbach alpha = 0.78) by Arifin et al.<sup>13</sup> DDS consisted 17-item measure (DDS17) consisted four cores: 1) five items – emotional burden; 2) four items – physician-related distress; 3) five items – regiment-related distress; and 4) three items – interpersonal distress, and each item was rated from 1 (no distress) to 6 (serious distress). A mean of total distress score was counted by calculating the sum and dividing by 17. A mean score of less than 2.0 was considered little or no distress, and equal to 2.0, or higher, reported as a diabetes-related distress event.

Regarding family support, data was collected using the Hensarling Diabetes Family Support questionnaire, which has been translated into the Indonesian language with validity ( $r = 0.856$ ) and reliability (Cronbach alpha = 0.94).<sup>14</sup> After that, respondents underwent physical examination such as measuring body weight and height to calculate body mass index data and taking blood samples for HbA1c examination. HbA1c value above 7% was categorised as uncontrolled glycaemic control.

## Data Analysis

The data that have been collected was processed using the Statistical Package for the Social Science (SPSS) application for IBM Statistics for Windows version 24.0. The statistical test used to analyse the relationship between the diabetes-related distress event and the factors associated with diabetes-related distress was the Chi-Square test, except for marital status and chronic complication (stroke-related diabetes) using Fisher's exact test. All factors that had a significance level  $p$ -value  $<0.25$  in the bivariate analysis were included in the multivariate analysis by the Logistic regression model. All of the significant differences of variables were considered if the  $p$ -value showed  $<0.05$ .

## Ethical Clearance

The study has been performed in accordance with the principles stated in the Declaration of Helsinki. This study was approved by the Ethical Committee Faculty of Medicine Udayana University-Sanglah Hospital (Ethical Certification No.2079/UN14.2.2.VII.14/LT/2020) and was agreed by the Department of Education and Research of Sanglah General Hospital-Bali (No. LB.02.01/XIV.2.2.1/1032/2021). All individual subjects have signed an informed consent before being used as a research sample.

## Results

This study involved 124 participants with characteristics: 60.5% male, age  $55.5 \pm 10.3$  years which 51.6% on productive age ( $<56$  years), 75% had high education (high school-college), 95.2% are married, 53.2% had diabetes less than 5 years, 22.6% perform routine physical activities, 60.5% have not received good education related to diabetes, 60.5% received insulin as diabetes therapy, 62.9% are overweight-obese, 58.1% of with uncontrolled glycaemic control, and 59.7% have not received good support from their family regarding living with diabetes. From diabetes-related acute and chronic complications, the prevalence of hypoglycemia in the last 3 months was 28.2%, 21.8% with diabetic nephropathy, 18.5% with diabetic retinopathy, 16.1% with diabetes-related coronary arterial disease, 12.1% with diabetic foot, and 4% with a history of ischemic stroke/hemorrhagic stroke. The prevalence of diabetes-related distress was 60.5% (Table 1).

In bivariate analysis, it was found that the factors that were significantly related to the diabetes-related distress were education related to diabetes ( $p < 0.001$ ), diabetes therapy regimen ( $p < 0.001$ ), glycaemic control ( $p < 0.001$ ), and family support ( $p < 0.001$ ) (Table 2). On the other hand, the incidence of hypoglycemia in the last 3 months ( $p < 0.001$ ) and diabetic retinopathy ( $p = 0.016$ ) were significantly associated with diabetes-related distress (Table 3).

In multivariate analysis, the diabetes treatment regimen (insulin use) (OR 8.30, 95% CI 2.24–30.72), hypoglycemia event in the last 3 months (OR 44.57, 95% CI 4.36–455.51), diabetic retinopathy (OR 10.28, 95% CI 1.54–68.70), and lack of family support (OR 44.79, 95% CI 10.02–200.22) were factors that significantly associated with diabetes-related distress (Table 4).

## Discussion

Diabetes and depression were bidirectional associations. Depression has a role in diabetes progression via hyperactivity of the hypothalamic–pituitary–adrenal (HPA) axis and sympathomedullary activation and reduces physical activity leading to obesity, increasing cortisol level and insulin resistance. Meanwhile, diabetes may contribute to the psychological aspect, specifically for patient burden of chronic disease management, requirements for high levels of self-care, and nervous system activation. Despite other mechanisms may overlap each other such as release oxidative stress, decreased glucose utilisation, glucocorticoid signalling, and inflammatory processes also contributed to these pathways.<sup>15</sup>

Diabetes-related distress was found in 60.5% of T2DM patients who visited the Diabetes Clinic of Sanglah General Hospital, Denpasar. with a mean DDS-17 score of 3 ( $3 \pm 1.72$ ). These results differed from previous studies in many

**Table 1** Characteristics of the Subjects

<b>Baseline Characteristics</b>	<b>n (%)</b>
Gender	
Male	75 (60.5)
Female	49 (39.5)
Age	
Productive age	64 (51.6)
Retired age	60 (48.4)
Education level	
High	94 (75.6)
Low	30 (24.4)
Marital status	
Married	118 (95.2)
Not married/divorce	6 (4.8)
Occupational status	
Employed	76 (61.3)
Not employed	48 (38.7)
Routine physical activity	
Yes	28 (22.6)
No	96 (77.4)
Education related to diabetes	
Well educated	49 (39.5)
Not educated well	75 (60.5)
Diabetes duration	
Less than 5 years	66 (53.2)
More than 5 years	58 (46.8)
Treatment regimen	
Oral	47 (39.5)
Insulin	77 (60.5)
Hypoglycemia event in last 3 months	
Yes	35 (28.2)
No	89 (71.8)
Body mass index	
Normal	46 (37.1)
Overweight/obesity	78 (62.9)
Glycemic control	
Uncontrolled	72 (58.1)
Controlled	52 (41.9)
Family support	
Non-supportive	74 (59.7)
Supportive	50 (40.3)
Chronic complication (yes)	
Diabetic retinopathy	23 (18.5)
Diabetic nephropathy	27 (21.8)
Diabetic foot	15 (12.1)
Diabetes-related coronary arterial disease	20 (16.1)
Ischemic or hemorrhagic stroke	5 (4)
Diabetes-related distress	
Diabetes-related distress	75 (60.5)
No distress/mild distress	49 (39.5)
Emotional burden	73 (58.9)
Physician distress	72 (58.1)
Regimen distress	72 (58.1)
Interpersonal distress	68 (54.8)

**Table 2** Associated Factors Between Total of Diabetes Distress and Characteristic of Participants (n=124)

Variable	No Distress/ Mild Distress n (%)	Diabetes Distress n (%)	Exp (B)	95% CI	p
Gender, n (%)					
Male	29 (38.7)	46 (61.3)	0.91	0.43–1.90	0.811
Female	20 (40.8)	29 (59.2)			
Age, n (%)					
Productive age	22 (34.4)	42 (65.6)	1.56	0.75–3.22	0.227
Retired age	27 (45)	33 (55)			
Education level, n (%)					
High education level	37 (39.4)	57 (60.6)	0.94	0.42–2.25	0.95
Low education level	12 (40)	18 (60)			
Marital status, n (%)					
Married	49 (41.5)	69 (58.5)	0.58	0.50–0.68	0.08**
Not married/divorced	0	6 (100)			
Occupational status, n (%)					
Employed	13 (37.1)	22 (62.9)	0.87	0.38–1.47	0.735
Not employed	36 (40.4)	53 (59.6)			
Routine physical activity, n (%)					
No	35 (36.5)	61 (63.5)	1.74	0.74–4.07	0.197
Yes	14 (50)	14 (50)			
Education related to diabetes, n (%)					
Not educated well	18 (24)	57 (76)	5.45	2.48–11.97	<0.001*
Well educated	31 (63.3)	18 (36.7)			
Diabetes duration, n (%)					
Less than 5 years	28 (42.4)	38 (57.6)	0.77	0.37–1.59	0.48
More than 5 years	21 (36.2)	37 (63.8)			
Treatment regimen, n(%)					
Insulin	18 (23.4)	59 (76.6)	6.35	2.84–14.15	<0.001*
Oral	31 (66)	16 (34)			
Body mass index, n(%)					
Normal	18 (39.1)	28 (60.9)	0.97	0.46–2.05	0.946
Overweight/ Obesity	31 (39.7)	47 (60.3)			
Glycemic control, n (%)					
Uncontrolled	19 (26.4)	53 (73.6)	3.80	1.77–8.13	<0.001*
Controlled	30 (57.7)	22 (42.3)			
Family support, n(%)					
Non-Supportive	12 (16.2)	62 (83.8)	14.70	6.07–35.59	<0.001*
Supportive	37 (74)	13 (26)			

**Note:** \*Statistically significant; \*\*Analysis using Fisher's exact test.

countries such as Canada (39%),<sup>5</sup> China (43%),<sup>16</sup> Bangladesh (48.5%),<sup>17</sup> the United States (51.3%),<sup>9</sup> Malaysia (49.2%),<sup>18</sup> and Iran (63.7%).<sup>19</sup> These results indicated that diabetes distress varies widely in different countries and healthcare settings, and it is not similar in terms of demographics, clinical characteristics in each geographical region, and cultural background. Our study was held in tertiary care with high predominantly diabetes distress, which contradicts the study conducted by Arifin. Latest study by Arifin et al shows participants in primary care had 3.68 times (95% CI 2.46–5.55) higher to having DD and found four factors related to DD, ie, younger age, participants with dependency on caregivers, higher levels of FBG, and experiencing two or more T2DM complications.<sup>20</sup> In our study, the level of

**Table 3** Association Between Total of Diabetes Distress and Complication Related with Diabetes of Participants (n=124)

Variable	No Distress/Mild Distress n (%)	Diabetes Distress n (%)	Exp (B)	95% CI	p
Hypoglycemia event in last 3 months, n (%)					
Yes	1 (2.9)	34 (97.1)	39.85	5.21–303.6	<0.001*
No	48 (53.9)	41 (46.1)			
Diabetic retinopathy, n (%)					
Yes	4 (17.4)	19 (82.6)	3.87	1.21–12.0	0.016*
No	45 (44.6)	56 (55.4)			
Diabetic nephropathy, n (%)					
Yes	9 (33.3)	18 (66.7)	1.40	0.57–3.44	0.457
No	40 (41.2)	57 (58.8)			
Diabetic foot, n(%)					
Yes	3 (20)	12 (80)	2.92	0.77–10.94	0.09
No	46 (42.2)	63 (57.8)			
Diabetes related coronary arterial disease, n (%)					
Yes	7 (35)	13 (65)	1.25	0.46–3.41	0.652
No	42 (40.4)	62 (59.6)			
Ischemic or hemorrhagic stroke, n (%)					
Yes	0 (0)	5 (100)	0.58	0.50–0.68	0.156**
No	49 (41.2)	70 (58.8)			

**Note:** Statistically significant; \*\*Analysis using Fisher's exact test.

**Table 4** Factors That Associated with Diabetes-Related Distress

Variable	First Model			Last Model		
	Crude OR	95% CI	p	Adjusted OR	95% CI	p
Age	1.56	0.75–3.22	0.227	–	–	–
Routine physical activity	1.74	0.74–4.07	0.197	–	–	–
Education related to diabetes	5.45	2.48–11.97	<0.001*	–	–	–
Treatment regimen	6.35	2.84–14.15	<0.001*	8.30	2.24–30.72	0.002*
Hypoglycemia event in last 3 months	39.85	5.21–303.6	<0.001*	44.57	4.36–455.51	0.001*
Diabetic retinopathy	3.87	1.21–12.0	0.016*	10.28	1.54–68.70	0.016*
Diabetic foot	2.92	0.77–10.94	0.09	–	–	–
Glycemic control	3.80	1.77–8.13	<0.001*	–	–	–
Family support	14.70	6.07–35.59	<0.001*	44.79	10.02–200.22	<0.001*

**Note:** \*Statistically significant.

education was predominantly low (60.5%) and was similar to the status of education of the primary care group in the Arifin study.

Other factors such as gender, age, education level, marital status, employment status, routine physical activity, duration of diabetes, diabetes-related education, and body mass index were not associated with diabetes-related distress. These results were similar to the study conducted by Polonsky et al.<sup>6</sup> Zhou et al<sup>16</sup> and Huynh et al.<sup>21</sup> In addition, from

this study, it was found that glycaemic control was not associated with diabetes-related distress. This is similar to the study conducted by Polonsky et al<sup>6</sup> and Zhou et al.<sup>16</sup>

This study revealed that the diabetes therapy regimen was significantly associated with diabetes-related distress events. This is similar to the studies conducted by Zhou et al,<sup>16</sup> Huynh et al,<sup>21</sup> and Delahanty<sup>22</sup> that diabetes therapy regimens, especially insulin, are associated with diabetes-related distress. Patients who use insulin as T2DM therapy are known to have higher distress levels than patients with diet and oral therapy. There are four reasons why insulin can cause diabetes-related distress. First, using insulin injection is more complex than using the OAD (oral anti-diabetic) regimen, so it requires more effort for the patients to use insulin, especially in geriatric patients.<sup>23</sup> Second, patients on insulin therapy generally have poorer glycemic control and have more chronic complications than patients on OAD regimens. This makes the patient feel guilty about failing to treat his/her diabetes.<sup>24</sup> Third, insulin is more expensive than the OAD regimen. Finally, patients with insulin therapy had a more hypoglycemic event as side effects than patients with OAD therapy, which can cause concern among users.

In this study, hypoglycemia event in the last 3 months was significantly associated with diabetes-related distress. This is similar to the study conducted by Aljuaid et al<sup>17</sup> and Ibrahim et al.<sup>25</sup> Hypoglycemia is one of the most common acute complications due to type 2 diabetes therapy such as insulin or sulfonylureas. A study conducted by Nefs showed that diabetes patients who experienced at least one event of hypoglycemia (either mild or severe) in the last 12 months had been burdened with their diabetes.<sup>26</sup> In addition, hypoglycemia is known to reduce patient compliance with the treatment process.<sup>27</sup> It can be concluded that the incidence of hypoglycemia needs to be a concern for health workers in the management of T2DM.

Diabetes-related chronic complications are known to be one of the factors associated with diabetes-related distress. In this study, only diabetic retinopathy was significantly associated with diabetes-related distress. This is similar to the study conducted by Aljuaid et al,<sup>17</sup> Gahlan et al<sup>28</sup> and Ibrahim et al.<sup>25</sup> Many quantitative studies have been conducted to examine the relationship between diabetic retinopathy and emotional disturbances in patients with T2DM. A meta-analysis study revealed that diabetic retinopathy is significantly associated with depression, distress, anxiety, somatisation, emotional instability, and low self-esteem.<sup>29</sup> In addition, diabetic retinopathy is also known to have other impacts on the lives of T2DM patients, such as impaired social and family function, social life isolation related to disability, increased dependence on others, decreased ability to work, and financial problem.<sup>30</sup>

Diabetes patients need family support to carry out their lives. Support that can be provided includes scheduling patients to meet with physicians and emotional assistance to provide comfort to patients to avoid diabetes-related distress.<sup>31</sup> This study showed that family support is one of the factors associated with diabetes-related distress. This is similar to the study conducted by Tunsuchart et al<sup>32</sup> and Geleta et al<sup>3,33</sup> It is known that the lower the autonomic support from family and friends, the worse the outcome of diabetes-related distress that is characterised by an increase in HbA1c levels.<sup>34</sup> A meta-analysis study revealed that including family in diabetes self-management education has been shown to improve diabetes management outcomes including glycemic control (HbA1c), blood pressure, lipid profile, and body mass index.<sup>35</sup>

This research has several limitations. First, the population of this study is T2DM patients who seek treatment at the Diabetes Clinic at Sanglah General Hospital, Denpasar as a tertiary health facility which makes this study difficult to generalise to the general population of T2DM. Second, limited sample size and assess the previous history of psychological components; Third, there is a recall bias during the interview. Researchers suggest further studies with more extended sampling with adjustment to assess anxiety or depression. It is important to enhance clinical awareness for recognising diabetes distress among T2DM. Hopefully, this data can be used in Indonesian healthcare policymaking for appropriate and prompt treatment of psychological aspects in T2DM patients. Diabetes-related distress screening and regular health promotion to elucidate diabetes and psychological may be a great potential action to improve public health and patient outcomes.

## Conclusion

Our present study revealed that diabetes distress prevalence is predominantly and associated among in type 2 diabetes mellitus. Diabetes-related distress is frequently seen in T2DM patients undergoing treatment. Treatment regimen, the

incidence of hypoglycaemia in the last 3 months, chronic complications related to diabetes (diabetic retinopathy), and family support are factors associated with diabetes-related distress in T2DM patients. Screening for diabetes-related distress is an important precaution for T2DM patients with insulin therapy, who had hypoglycemia in the last 3 months, diabetic retinopathy complication, and lack of family support.

## Ethical Approval

This study was approved by Ethical Committee Faculty of Medicine Udayana University-Sanglah Hospital (Ethical Certification No.2079/UN14.2.2.VII.14/LT/2020).

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Disclosure

The authors declared no conflicts of interest in this work.

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