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Assessing Diabetes Related Distress in Type 2 Diabetes Mellitus: A Prospective Interventional Study

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ABSTRACT

Background: Diabetes mellitus (DM) is a chronic metabolic disorder that often leads to diabetes-related distress (DRD), adversely affecting self-care, glycemic control, and increasing the risk of complications.

Objective: To assess the prevalence and predictors of diabetes-related distress among type 2 diabetes mellitus patients and to evaluate its association with clinical parameters, complications, and sociodemographic factors.

Methods: A prospective interventional study was conducted among 469 patients with type 2 diabetes patients. Inclusion criteria were adults aged ≥18 years with a diagnosis of type 2 diabetes for ≥6 months, while exclusion criteria included Type 1 diabetes and incomplete medical records. Participants provided informed consent, and ethical approval was obtained. Demographic, clinical, and psychosocial data were collected via patient interviews, with diabetes-related distress assessed using the DDS and PAID questionnaires. Statistical analyses included descriptive statistics, Spearman's correlation, and logistic regression to identify predictors of distress, with $p<0.05$ considered significant.

Results: The study revealed that 43.07% of patients experienced high emotional distress (PAID score >40), with emotional burden (38.17%) and regimen-related distress (26.43%) being the most common DDS subscales affected. Neuropathy (14.12%), retinopathy (11.88%), and slow wound healing (14.68%) were prevalent complications. Emotional distress was significantly associated with LDL (ρ=0.140, p=0.002), GRBS (ρ=0.143, p=0.002), BMI (ρ=0.128, p=0.006), and neuropathy (ρ=0.150, p<0.001). Logistic regression identified age >60 years, male gender, unmarried status, sedentary lifestyle, and comorbidities (neuropathy, retinopathy, nephropathy) as significant predictors of high diabetes distress and PAID scores.

Conclusion: The emotional and psychological burden of managing diabetes, known as diabetes distress, plays a significant role in patients' overall well-being and disease management.

Keywords: *diabetes, diabetic related distress, psychological distress, DDS, PAID scale*

1. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic condition characterized by insufficient insulin secretion and/or insulin resistance, resulting in impaired glucose uptake, reduced glucose storage, and disrupted carbohydrate and lipid metabolism. Diabetes-related distress (DRD) is a psychological condition often observed in poorly controlled diabetes, negatively affecting prognosis and overall disease management[4]. India is witnessing a rapid increase in type 2 diabetes mellitus (T2DM) cases, with estimates suggesting 134 million cases by 2045. Diabetes distress (DD) among these patients shows a wide prevalence range from 8.45% to 61.48%, with an average rate of around 33%[1]. Diabetes distress (DD) can hinder self-care behaviors, leading to poorer diabetes management and increased risk of complications due to diminished confidence and feelings of failure. Understanding its prevalence and contributing factors is essential for improving the emotional and clinical care of individuals with diabetes[2]. Diabetes distress (DD) is linked to poor glycemic control and reduced adherence to recommended dietary and physical activity regimens, further complicating diabetes management[3]. Psychological distress in individuals with diabetes often arises from the challenges of maintaining lifestyle changes, adhering to dietary modifications, and managing long-term use of diabetic medications. Psychological distress in diabetes is an emotional response to the specific challenges and demands of managing the disease[5].

2. MATERIALS AND METHODS

Study design and setting

A prospective interventional study was conducted over 36 months among type 2 diabetic patients at a 450-bed multispecialty tertiary care teaching hospital in Chalakudy, Thrissur, Kerala.

Inclusion and exclusion criteria

The study enrolled 469 patients diagnosed with diabetes at a tertiary care hospital, meeting specific inclusion criteria. The inclusion criteria consisted of patients diagnosed with type 2 diabetes mellitus for not less than 6 months, diabetes patients who are admitted to General Medicine, Cardiology, Orthopedics, Surgery, and Gynecology departments, adults aged ≥ 18 years, and those who signed informed written consent were recruited to the study. Exclusion criteria included patients under 18, those unwilling to participate in the study, Type 1 diabetic patients, Pediatrics and Psychiatry patients, and patients with incomplete medical records.

Study procedure

A total of 469 patients diagnosed with type 2 diabetes were assessed for psychological distress. Informed consent was obtained from each participant, and the study protocol received approval from the institution's ethics committee. At the outset, Patient demographic details, current complaints, past medical history, current drugs prescribed, drug interactions, adverse drug reactions, laboratory values, and diagnostic tests were collected in a specially designed data entry form during ward rounds. Psychosocial distress problems and complications were analyzed by using a questionnaire (DDS & PAID) from direct patient interviews.

The Problem Areas in Diabetes (PAID) scale, developed by the Joslin Diabetes Center, is a validated 20-item self-report tool used to assess diabetes-related emotional distress. It addresses issues such as guilt, frustration, and fear of complications. Each item is scored from 0 (not a problem), 1 (Minor problem), 2 (Moderate problem), 3 (Somewhat serious problem), and 4 (a serious problem). The total score is calculated by summing item scores and multiplying by 1.25, yielding a score out of 100. A total score of 40 or higher suggests severe distress, while individual items rated 3 or 4 indicate areas needing attention during clinical follow-up[6].

Diabetes Distress Scale (DDS-17) is a validated 17-item self-report instrument that evaluates four domains of diabetes-related distress: emotional burden (EB, 5 items), physician-related distress (PRD, 4 items), regimen- related distress (RRD, 5 items), and interpersonal distress (ID, 3 items). Each item is rated on a 6-point Likert scale, ranging from 1 to 6 reflecting the distress experienced over the last month: 1 (not a problem), 2 (a slight problem), 3 (a moderate problem), 4 (a somewhat serious problem), 5 (a serious problem), and 6 (a very serious problem). Total possible scores for DDS-17 will be 17–102 (average 1–6). Thus, the actual average scores for the DDS-17 and their subscales yield 3 patient subgroups: little or no distress, <2.0; moderate distress, 2.0–2.9; high distress, ≥3.0. A mean item score of 2.0 or higher is considered clinically significant and may warrant further evaluation and intervention[7].

Awareness about the disease will be provided to the patients through patient counseling and Patient information leaflets.

Statistical analysis

Descriptive statistics were used to describe the population, and Spearman's rank correlation coefficient was used to analyze data for significant correlation between laboratory values and complications with diabetic distress scales. Logistic regression was used to identify the predictors of diabetic related distress, and a p-value

<0.05 was considered statistically significant.

3. RESULTS

Sociodemographic and clinical profiles of study participants

Among the 469 diabetic patients studied, the majority were 61–70 years (37.31%), with a slight male predominance (54.79%). Most participants were married (72.92%) and had secondary school education (47.97%). Social habits showed that 39.23% had no history of alcohol or smoking, while 20.46% engaged in both. Nearly half (48.40%) had diabetes for 5–10 years. Most resided in rural areas (61.41%) and led a non- sedentary lifestyle (66.52%). Employment was reported by 52.66% of the participants. Regarding comorbidities, 40.51% had more than two, while 24.73% had none.

Table 1; Sociodemographic and clinical profiles of study participants

Characteristics	Number (%)
Age (year) <40 41-50 51-60 61-70 71-80 >80	45(9.59) 38(8.10) 112(23.88) 175(37.31) 62(13.21) 37(7.88)
Sex Female Male	212(45.20) 257(54.79)
Marital status Married Unmarried	342(72.92) 127(27.08)
Educational status Primary school Secondary school Diploma Degree and above	82(17.48) 225(47.97) 109(23.24) 53(11.30)
Social habits Alcohol Smoking Both None	112(23.88) 77(16.41) 96(20.46) 184(39.23)
Duration of diabetes <5 5-10 >10	170(36.25) 227(48.40) 72(15.35)
Place of residence Rural Urban	288(61.41) 181(38.59)
Life style Sedentary Non sedentary	157(33.47) 312(66.52)
Employment Yes No	247(52.66) 222(47.34)
Comorbidities Comorbidities = 1	163(34.75)
Comorbidities >2 None	190(40.51) 116(24.73)

Comorbidities among the diabetes population

Among the diabetic patients, hypertension was the most prevalent comorbidity (33.42%), followed by dyslipidemia (23.79%) and thyroid disorders (20.11%). Other reported conditions included urinary tract infections (8.21%), stroke (7.36%), ulcers (2.54%), carpal tunnel syndrome (2.54%), and periarthritis (1.98%).

Table 2; Comorbidities among the diabetes population

Comorbidities	Number (%)
HTN	118 (33.42)
DLP	84(23.79)
Thyroid disorders	71(20.11)
Stroke	26(7.36)
UTI	29(8.21)
Ulcer	9(2.54)
CTS	9(2.54)
Periarthrits	7(1.98)

Diabetes-Related Complications Among Patients

The most common complications observed among diabetic patients were slow wound healing (14.68%) and neuropathy (14.12%), followed by diabetic foot (11.99%), retinopathy (11.88%), and coronary artery disease (11.43%). Nephropathy affected 9.86% of patients, while sleep apnea (7.17%) and cellulitis (5.71%) were also noted. Less frequent complications included lipohypertrophy (5.26%), dementia (5.26%), and diabetic ketoacidosis (2.57%).

Table 3; Diabetes-Related Complications Among Patients

Complications	Number (%)
Neuropathy	126 (14.12)
Retinopathy	106(11.88)
Nephropathy	88(9.86)
Diabetic foot	107(11.99)
Diabetic ketoacidosis	23(2.57)
CAD	102(11.43)
Lipohypertrophy	47(5.26)
Dementia	47(5.26)
Cellulitis	51(5.71)
Sleep apnoea	64(7.17)
Slow healing	131(14.68)

Diabetes distress scale (DDS) scores

Based on the Diabetes Distress Scale (DDS) subscales, emotional burden was the most prominent, with 38.17% of patients experiencing high distress and 41.37% reporting moderate distress. Regimen-related distress followed, with 26.43% experiencing high and 29.00% moderate distress. Physician-related distress was notably low, with only 4.69% reporting high distress and the majority (72.50%) showing no distress. Interpersonal distress was also relatively low, as 69.94% had no distress, while only 8.1% experienced high distress. Theseresults highlight that emotional and regimen-related factors contribute most to diabetes-related psychological stress.

Table 4; Diabetes distress scale (DDS) scores

Sub scale	High distress	Moderate distress	No distress
Emotional burden	179	194	96
Physician-related distress	22	107	340
Regimen-related distress	124	136	209
Interpersonal distress	38	103	328

Problem Areas in Diabetes (PAID) scale scores

According to the PAID scale, 267 patients (56.93%) scored below 40, indicating lower diabetes-related emotional distress, while 202 patients (43.07%) scored above 40, suggesting high emotional distress and greater psychological burden. This highlights that a substantial proportion of diabetic patients are experiencing significant emotional challenges related to diabetes management.

Table 5; Problem Areas in Diabetes (PAID) scale scores

PAID scale	Number
<40	267
>40	202

Correlation with laboratory values and distress scales

Correlation analysis revealed significant associations between several clinical parameters and diabetes-related distress. Total cholesterol levels were positively correlated with physician-related distress (ρ = 0.094, p = 0.045) and PAID scores (ρ = 0.126, p = 0.006). LDL levels showed a significant positive correlation with emotional distress (ρ = 0.140, p = 0.002), while GRBS (random blood sugar) was significantly associated with both emotional distress (ρ = 0.143, p = 0.002) and PAID scores (ρ = 0.117, p = 0.011). BMI also showed a significant positive correlation with PAID scores (ρ = 0.128, p = 0.006). These findings suggest that poor glycemic control, elevated cholesterol, and higher BMI are linked with greater psychological burden and diabetes-related distress.

Table 6; Correlation with laboratory values and distress scales using Spearman's rank correlation (ρ value (rho value))

Factors	Emotional		Physician		Regimen		Interpersonal		PAID	
	ρ value	p value	ρ value	p value	ρ value	p value	ρ value	p value	ρ value	p value
SBP	0.022	0.628	-0.046	0.325	0.059	0.200	0.040	0.384	0.026	0.469
DBP	0.014	0.754	-0.003	0.955	0.050	0.275	0.011	0.817	0.080	0.085
Cholesterol	0.089	0.054	0.094	0.045*	0.037	0.419	0.083	0.781	0.126	0.006**
LDL	0.140	0.002**	0.058	0.213	-0.038	0.409	0.046	0.318	0.058	0.211
HDL	-0.051	0.270	-0.071	0.124	0.043	0.351	-0.008	0.860	-0.022	0.628
FBS	0.022	0.640	0.001	0.976	0.052	0.257	0.005	0.909	0.070	0.130
GRBS	0.143	0.002**	-0.006	0.896	0.062	0.182	0.011	0.821	0.117	0.011*
BMI	0.046	0.317	0.036	0.436	0.083	0.074	0.068	0.144	0.128	0.006**

****Significant at 0.01 level, * Significant at 0.05 level Correlation with diabetes complications and distress scales**

Significant correlations were observed between several diabetes-related complications and psychological distress. Neuropathy was strongly associated with both emotional distress ($\rho = 0.150$, $p < 0.001$) and higher PAID scores ($\rho = 0.160$, $p = 0.001$). Similarly, retinopathy showed a positive correlation with regimen-related distress ($\rho = 0.101$, $p = 0.029$) and PAID scores ($\rho = 0.155$, $p = 0.001$). Nephropathy was significantly associated with physician-related distress ($\rho = 0.124$, $p = 0.007$) and PAID scores ($\rho = 0.097$, $p = 0.037$). Coronary artery disease (CAD) showed significant correlations with emotional ($\rho = 0.189$, $p < 0.001$), regimen-related ($\rho = 0.104$, $p = 0.024$), and PAID scores ($\rho = 0.123$, $p = 0.008$). Dementia was also linked with higher emotional distress ($\rho = 0.096$, $p = 0.037$). Sleep apnea was significantly associated with emotional distress ($\rho = 0.150$, p

< 0.001) and PAID scores ($\rho = 0.092$, $p = 0.047$). Additionally, cellulitis showed mild positive correlations with physician-related distress ($\rho = 0.097$, $p = 0.036$) and interpersonal distress ($\rho = 0.092$, $p = 0.046$). These findings suggest that microvascular and cardiovascular complications notably impact the psychological well-being of diabetic patients.

Table 7; Correlation with diabetes complications and distress scales using Spearman's rank correlation (ρ value (rho value))

Factors	Emotional		Physician		Regimen		Interpersonal		PAID	
	ρ value	p value	ρ value	p value	ρ value	p value	ρ value	p value	ρ value	p value
Neuropathy	0.150	<0.001***	-0.058	0.209	0.055	0.232	0.009	0.845	0.160	0.001***
Retinopathy	0.006	0.893	-0.022	0.649	0.101	0.029	0.064	0.168	0.155	0.001***
Nephropathy	-0.030	0.520	0.124	0.007**	-0.036	0.441	0.060	0.191	0.097	0.037*
Diabetes foot	-0.042	0.367	-0.013	0.776	-0.008	0.866	-0.016	0.722	-0.025	0.589
DKA	0.088	0.058	-0.046	0.317	-0.085	0.065	0.011	0.820	-0.090	0.051
CAD	0.189	<0.001***	-0.044	0.343	0.104	0.024	0.090	0.051	0.123	0.008**
Lipohypertrophy	-0.028	0.543	-0.059	0.205	-0.022	0.640	-0.088	0.056	0.033	0.474
Dementia	0.096	0.037*	-0.043	0.357	-0.050	0.275	-0.056	0.227	-0.025	0.592
Cellulitis	-0.030	0.514	0.097	0.036*	0.032	0.493	0.092	0.046*	0.022	0.636
Sleep apnea	0.150	<0.001***	0.004	0.925	0.013	0.786	0.087	0.060	0.092	0.047*
Slow healing	0.054	0.239	-0.019	0.686	-0.39	0.400	-0.026	0.580	-0.017	0.722

***Significant at 0.05 level, **Significant at 0.01 level, *** Significant at 0.001 level Predictors of diabetic related distress**

Logistic regression revealed several significant predictors of diabetes-related distress and emotional burden. Patients aged over 60 years had significantly higher odds of high PAID distress (OR = 1.52, $p = 0.017$). Male gender was associated with greater interpersonal distress (OR = 1.80, $p = 0.005$). Having fewer than two comorbidities significantly reduced physician-related (OR = 0.60, $p = 0.015$) and regimen-related distress (OR

= 0.68, $p = 0.035$). Lower educational level (secondary vs. degree) was associated with lower PAID distress (OR = 0.64, $p = 0.047$). Unmarried individuals had significantly higher odds of elevated PAID distress (OR = 1.90, $p = 0.003$). Patients with a longer duration of diabetes (>5 years) showed higher physician-related distress (OR = 1.56, $p = 0.046$). A sedentary lifestyle was significantly linked to higher regimen-related distress (OR = 0.67, $p = 0.039$).

Among complications, neuropathy was a strong predictor of emotional distress (OR = 2.74, $p = 0.001$) and high PAID scores ($p = 0.008$). Retinopathy significantly increased the odds of regimen-related distress (OR = 1.65, $p = 0.029$) and high PAID scores (OR = 1.52, $p = 0.013$). Nephropathy was a significant predictor of physician- related distress (OR = 1.94, $p = 0.007$).

Table 8; Predictors of diabetic related distress

Factors		EMOTIONAL		PHYSICIAN		REGIMEN		INTERPERSONAL		PAID scale	
		0R (CI)	P VALUE	0R (CI)	P VALUE	0R (CI)	P VALUE	0R (CI)	P VALUE	0R (CI)	P VALUE
Age	**>60**	0.77 (0.48-1.21)	0.250	0.91 (0.60-1.40)	0.676	1.14 (0.78-1.67)	0.507	0.83 (0.55-1.26)	0.783	1.52 (1.12-2.34)	0.017*
	<60										
Gender	**Male**	1.14 (0.72-1.78)	0.305	1.22 (0.81-1.84)	0.341	0.81 (0.56-1.17)	0.269	1.80 (1.20-2.70)	0.005**	0.76 (0.52-1.11)	0.156
	Female										
Comor	**<2**	1.08 (0.69-1.69)	0.745	0.60 (0.40-0.91)	0.015*	0.68 (0.47-0.97)	0.035*	0.84 (0.57-1.25)	0.733	1.24 (0.84-1.81)	0.276
	>2										
Education	**Secondary**	0.74 (046-1.21)	0.232	0.80 (0.53-1.22)	0.304	1.22 (0.83-1.79)	0.304	0.89 (0.59-1.35)	0.582	0.64 (0.50-0.97)	0.047*
	Degree										
Marital	**Married**	0.81 (0.50-1.33)	0.407	1.02 (0.65-1.61)	0.936	1.15 (0.76-1.74)	0.509	0.86 (0.55-1.35)	0.513	1.90 (1.24-2.92)	0.003**
	Unmarried										
Duration	**<5**	0.99 (0.62-1.58)	0.961	1.56 (1.01-2.41)	0.046*	0.75 (0.51-1.10)	0.140	0.91 (0.60-1.36)	0.632	0.92 (0.62-1.37)	0.681
	>5										
Residence	**Rural**	1.19 (0.74-1.89)	0.473	0.92 (0.61-1.40)	0.705	0.99 (0.68-1.44)	0.948	1.12 (0.75-1.67)	0.593	1.13 (0.76-1.68)	0.547
	Urban										
Lifestyle	**Sedentary**	1.12 (0.69-1.82)	0.639	0.79 (0.51-1.22)	0.281	0.67 (0.45-0.98)	0.039*	0.84 (0.55-1.28)	0.405	0.84 (0.55-1.28)	0.304
	Non sedentary										
Employment	**Yes**	1.14 (0.73-1.79)	0.576	1.41 (0.94-2.11)	0.100	1.11 (0.77-1.59)	0.586	0.89 (0.60-1.33)	0.580	0.89 (0.60-1.33)	0.352
	No										
BMI	**≥25**	0.69 (0.44-1.09)	0.108	0.87 (0.58-1.31)	0.424	1.36 (0.94-1.96)	0.100	0.73 (0.49-1.09)	0.123	0.73 (0.49-1.09)	0.684
	<25										
Neuropathy	**Yes**	2.740 (1.47-5.12)	0.001***	0.74 (0.46-1.19)	0.208	1.29 (0.85-1.95)	0.231	1.13 (0.73-1.76)	0.582	1.13 (0.73-1.76)	0.008**
	No										
Retinpathy	**Yes**	1.04 (0.60-	0.892	0.89 (0.54-	0.641	1.65 (1.05-	0.29*	1.52 (0..96-	0.073	1.52 (0..96-	0.013*
	No										

		1.784)		1.46)		2.58)		2.40)		2.40)	
Nephropathy	**Yes**		0.519		0.007**		0.440		0.076		0.399
	No	0.83 (0.48-1.46)		1.94 (1.19-3.16)		0.83 (0.52-1.38)		1.55 (0.95-2.52)		1.55 (0.95-2.52)	

***Significant at 0.05 level, **Significant at 0.01 level, *** Significant at 0.001 level**

4. DISCUSSION

The current study aimed to assess the psychosocial distress problems in type II diabetic patients using DDS and PAID scale. The mean age group of the study population falls between 61–70 years, with a male predominance. Similarly, a study from Norway reported an average age of 67.3 years with 57.2% males[8], while a study from Delhi showed a mean age of 60–69 years with female predominance[9]. The prevalence of diabetic distress in the current study was found to be 43.07% using the PAID scale. In comparison, studies from India reported 24.6% in Bihar[10] and 32.8% in Tamil Nadu[11]. Internationally, Malaysia[12] and Germany[13] reported 36% and 30.8%, respectively, while Kuwait showed 27.8%[14], all using the PAID scale. A study from Delhi using the DDS-17 scale reported a prevalence of 35.4%[9].

In the DDS scale, Emotional burden had the highest number of cases with high distress (179), followed by regimen-related distress (124), while interpersonal (38) and physician-related distress (22) had the least high distress cases. A study conducted in Delhi also observed that emotional burden was the most commonly reported distress type (39.8%), with interpersonal distress being considerably lower (12.4%)[9]. Meanwhile, research from Haryana indicated a greater prevalence of regimen-related distress (61.2%), followed by emotional distress (53.95%)[15]. On the other hand, findings from Karnataka highlighted interpersonal distress as the most prominent (13.6%), with emotional distress being reported in 7.6% of cases[16].

The study revealed significant associations between diabetes-related distress (assessed by DDS and PAID scales) and clinical parameters such as cholesterol, LDL, GRBS, BMI, and HbA1c, consistent with prior research[17-20]. Distress was also linked to a higher estimated 10-year coronary heart disease risk[17]. Dyslipidemia—characterized by elevated LDL and triglycerides and low HDL—was a contributing factor[18]. Higher BMI correlated with greater emotional burden, potentially due to issues with body image, dietary restrictions, physical inactivity, and weight-related stigma, supporting earlier findings[21-23]. Additionally, emotional distress in diabetes is associated with poor glycemic control, reduced quality of life, and increased mortality risk[9,24]. These findings highlight the importance of comprehensive, multifactorial strategies by family physicians to improve both metabolic outcomes and psychological well-being in diabetic patients[20].

Diabetes-related distress (DRD) was significantly influenced by gender, marital status, education, comorbidities, and duration of diabetes. Males in our study were 1.8 times more likely to report interpersonal distress, aligning with findings by[25], though some studies suggest females are at higher risk[14,26,27]. Marital status appears to impact women more than men in terms of DRD[28]. Educational level also played a role—participants with secondary education reported less distress than those with higher education, a finding supported by evidence that older and less-educated individuals experience more emotional distress[29]. Diabetes self- management education (DSME) has been shown to improve glycemic control and reduce distress[30].

Comorbidities were also linked with DRD. Patients with fewer than two comorbidities had lower physician- and regimen-related distress, consistent with Dogra P et al.[16]. Comorbid conditions in T2DM increase treatment burden and healthcare demands, contributing to distress and reduced productivity[31]. Moreover, diabetes duration was associated with distress; individuals with longer duration (>5 years) reported greater physician-related distress. This supports earlier research indicating that patients living with diabetes for over 15 years face a higher risk of distress[26,32,33], likely due to progressive complications and treatment intensity.

Interventions aimed at reducing diabetes-related distress involve personalized counseling, structured diabetes education, peer support networks, and integrated care models that address both emotional well-being and self-management challenges. Psychological interventions specifically designed for individuals with type 2 diabetes have been shown to effectively reduce diabetes distress in the short term. The effectiveness of these interventions is further enhanced when they are delivered in a group setting, incorporate technology-based components, are facilitated by trained psychologists, or target individuals with elevated baseline levels of diabetes distress[34].

Problem-Solving Therapy for Diabetes (PST-D) has emerged as a promising approach for enhancing psychological well-being and improving glycemic control in individuals with type 2 diabetes[35]. Screening for diabetes distress can be effectively implemented at the community level through NCD (Non-Communicable Disease) clinics by utilizing validated tools such as

the T2-Diabetes Distress Assessment System (T2-DDAS), allowing for early identification and personalized intervention. On a broader scale, integrating psychosocial evaluations into the care protocols of the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) is essential. This should be supported by awareness initiatives, healthcare provider training, and active involvement of community health workers. A coordinated effort involving policymakers, healthcare professionals, researchers, and patient advocates is vital to mitigate the rising burden of diabetes distress among individuals with type 2 diabetes in India[36].

5. CONCLUSION

The emotional and psychological burden of managing diabetes, known as diabetes distress, plays a significant role in patients' overall well-being and disease management. Around 30-40% of people with diabetes experience moderate to severe distress, which negatively impacts glycemic control, HbA1c levels, and medication adherence. Tackling this distress through regular screening and interventions like Cognitive Behavioral Therapy (CBT), peer support, and family education is vital for improving both emotional and physical health outcomes. A comprehensive approach that combines medical, emotional, and social support is essential for enhancing diabetes care and the quality of life for patients.

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REFERENCES

[1] Sinha R, Priya A, Sinha A, Hifz Ur Rahman M. Prevalence of diabetes distress among type 2 diabetes mellitus patients in India: a systematic review and meta-analysis. *Health Psychol Behav Med*. 2024;12(1):2324091. Published 2024 Mar 5. doi:10.1080/21642850.2024.2324091

[2] Niroomand M, Babaniamansour S, Aliniagerdroudbari E, Golshaian A, Meibodi AM, Absalan A. Distress and depression among patients with diabetes mellitus: prevalence and associated factors: a cross-sectional study. *J Diabetes Metab Disord*. 2021;20(1):141-151. Published 2021 Jan 18. doi:10.1007/s40200-020- 00721-y

[3] Jashalynn German, Elizabeth A Kobe, Allison A Lewinski, Amy S Jeffreys, Cynthia Coffman, David Edelman, Bryan C Batch, Matthew J Crowley, Factors Associated With Diabetes Distress Among Patients With Poorly Controlled Type 2 Diabetes, *Journal of the Endocrine Society*, Volume 7, Issue 5, May 2023, bvad031, https://doi.org/10.1210/jendso/bvad031

[4] Ibrahim A, Rida A, Dakroub D, et al. Association between diabetes distress and sociodemographic and/or socioeconomic factors among adults: A cross-sectional study. *Heliyon*. 2023;9(11):e21767. Published 2023 Nov 14. doi:10.1016/j.heliyon.2023.e21767

[5] Blangeti GK, Chima T, Kamanga CN, Mkwinda E. Prevalence and Associated Factors of Psychological Distress Among Diabetic Patients at Thyolo District Hospital in Malawi: A Hospital-Based Cross-Sectional Study. *Diabetes Metab Syndr Obes*. 2024;17:893-901. Published 2024 Feb 22. doi:10.2147/DMSO.S445146

[6] Polonsky WH, Anderson BJ, Lohrer PA, Welch G, Jacobson AM, Aponte JE, et al.. Assessment of diabetes-related distress. DiabetesCare. 1995Jun;18(6):754–60. https://doi.org/10.2337/diacare.18.6.754[PubMed]0149-5992

[7] Polonsky WH, Fisher L, Earles J, et al. Assessing psychosocial distress in diabetes: development of the diabetes distress scale. Diabetes Care. 2005;28(3):626-631. doi:10.2337/diacare.28.3.626

[8] Riise HKR, Haugstvedt A, Igland J, et al. Diabetes distress and associated psychosocial factors in type 2 diabetes. A population-based cross-sectional study. The HUNT study, Norway. Diabetol Metab Syndr. 2025;17(1):62. Published 2025 Feb 19. doi:10.1186/s13098-025-01631-w

[9] Alwani, A.A., Kaur, R., Bairwa, M. et al. Diabetes distress and associated factors among adults with diabetes mellitus residing in a metropolitan city of India: a community-based study. Clin Diabetes Endocrinol 10, 40 (2024). https://doi.org/10.1186/s40842-024-00203-7

[10] Naik, Bijaya N.1; Rao, Rajath2; Verma, Manisha3; Nirala, Santosh K.1; Pandey, Sanjay1; Gera, Mounica4; Ramalingam, Anuvarshini1. Prevalence of diabetes distress and its correlates among adults with type 2 diabetes mellitus in a primary health center of Bihar − A cross-sectional study. Journal of Family Medicine and Primary Care 13(8):p 3275-3281, August 2024. | DOI: 10.4103/jfmpc.jfmpc_96_24

[11] Thomas, Lydiya1; Asha, Hesarghatta S.2,; Amalraj, Raja E.3; Prakash, R.4; Abraham, Prakash5; Thomas, Nihal2. The utility of Problem Areas in Diabetes (PAID) scale amongst patients with Type 2 diabetes (T2DM):

An experience from a teaching hospital in Southern India. Journal of Family Medicine and Primary Care 10(4):p 1687-1693, April 2021. | DOI: 10.4103/jfmpc.jfmpc_1891_20

[12] Jannoo Z, Yap B, Razali N, Gnanasan S, Hassali M, Shafie A, et al Examining the Problem Areas In Diabetes scale (MY-PAID-20) among Malay T2DM patients Int J Bio and Biomed Engineering. 2014;8:157–63

[13] Hermanns N, Kulzer B, Krichbaum M, Kubiak T, Haak T. How to screen for depression and emotional problems in patients with diabetes: Comparison of screening characteristics of depression questionnaires, measurement of diabetes-specific emotional problems and standard clinical assessment Diabetologia. 2006;49:469–7

[14] AlOzairi A, Irshad M, AlKandari J, AlSaraf H, Al-Ozairi E. Prevalence and predictors of diabetes distress and depression in people with type 1 diabetes. Front Psychiatry. 2024;15:1367876. Published 2024 Mar 22. doi:10.3389/fpsyt.2024.1367876

[15] Ranjan R, Rajput M, Sachdeva A, Saha A, Jyotsana, Yadav K. Prevalence of diabetes distress and cross- cultural reliability of DDS-17 scale in rural Haryana. J Family Med Prim Care. 2023;12(9):2064-2069. doi:10.4103/jfmpc.jfmpc_496_23

[16] Dogra, P., S., R. P., & B. J., S. (2017). Assessment of depression and diabetes distress in type 2 diabetes mellitus patients in a tertiary care hospital of South India. International Journal of Research in Medical Sciences, 5(9), 3880–3886. https://doi.org/10.18203/2320-6012.ijrms20173696

[17] Young, Clipper & Cheng, Jinjing & McCarter, Gordon. (2019). Associations Between Diabetes-Related Distress and Cardiovascular Complication Risks in Patients With Type 2 Diabetes and Lower Socioeconomic Status: A Pilot Study. Diabetes Spectrum. 32. ds180023. 10.2337/ds18-0023.

[18] Wu L, Parhofer KG. Diabetic dyslipidemia. Metabolism. 2014;63(12):1469-1479. doi:10.1016/j.metabol.2014.08.010

[19] Miss. Anuradha Gurappa Melligeri, Dr. Deelip S Natekar, Miss. Priyanka R, Mr.Sangamesh H, Mr. Shreekanth K, Miss. Sudha K, Mr. Sangamesh A, Miss. Sujata, Ms. Rama. N. A Correlation Study to Assess the Relationship between Diabetic Distress and Blood Glucose Level among Diabetic Patients Attending to Medical OPD of HSK Hospital and Research Centre Bagalkot. JCHR (2024) 14(5), 1483-1487

[20] Elotla SF, Fouad AM, Mohamed SF, et al. Association between diabetes-related distress and glycemic control in primary care patients with Type 2 diabetes during the coronavirus disease 2019 (COVID-19) pandemic in Egypt. J Family Community Med. 2023;30(1):42-50. doi:10.4103/jfcm.jfcm_238_22

[21] Islam MR, Karim MR, Habib SH, Yesmin K. Diabetes distress among type 2 diabetic patients. Int J Med Biomed Res. 2013;2(2):113–124.

[22] Ibrahim A, Rida A, Dakroub D, et al. Association between diabetes distress and sociodemographic and/or socioeconomic factors among adults: A cross-sectional study. Heliyon. 2023;9(11):e21767. Published 2023 Nov 14. doi:10.1016/j.heliyon.2023.e21767

[23] Gariepy G, Wang J, Lesage A, Schmitz N. The interaction of obesity and psychological distress on disability. Soc Psychiatry Psychiatr Epidemiol. 2010;45(5):531-540. doi:10.1007/s00127-009-0090-9

[24] MS, Hamed & NA, Ibrahim & HM, Ali & CG, Kheir. (2019). Study of the effect of glycemic control on the diabetes-related distress in a sample of Egyptian patients with diabetes mellitus. Diabetes Updates. 5. 10.15761/DU.1000134.

[25] Nguyen, Phuong & Tra, Bui & Le Xuan, Hung & Hung, Nguyen. (2024). Impact of Distress on the Nutritional Status of Patients with Type 2 Diabetes Mellitus at the National Hospital of Endocrinology in 2022. Human Nutrition & Metabolism. 37. 200278. 10.1016/j.hnm.2024.200278.

[26] AlOtaibi AA, Almesned M, Alahaideb TM, Almasari SM, Alsuwayt SS. Assessment of diabetes-related distress among type 2 diabetic patients, Riyadh, Saudi Arabia. J Family Med Prim Care. 2021;10(9):3481- 3489. doi:10.4103/jfmpc.jfmpc_488_21

[27] Lašaite, Lina & Dobrovolskienė, Rimantė & Danytė, Evalda & Stankutė, Ingrida & Ražanskaitė- Virbickienė, Dovilė & Schwitzgebel, Valerie & Marčiulionytė, Dalia & Verkauskiene, Rasa. (2016). Diabetes distress in males and females with type 1 diabetes in adolescence and emerging adulthood. Journal of Diabetes and its Complications. 30. 10.1016/j.jdiacomp.2016.08.013.

[28] Huang LC, Lin CL, Chang YT, Chen RY, Bai CH. Gender Impact on Diabetes Distress Focus at Medical Communication Concerns, Life and Interpersonal Stress. Int J Environ Res Public Health. 2022;19(23):15678. Published 2022 Nov 25. doi:10.3390/ijerph192315678

[29] Ibrahim A, Rida A, Dakroub D, et al. Association between diabetes distress and sociodemographic and/or socioeconomic factors among adults: A cross-sectional study. Heliyon. 2023;9(11):e21767. Published 2023 Nov

14. doi:10.1016/j.heliyon.2023.e21767

[30] Anjali M, Khapre M, Kant R, Kumar S, Pandey P. Effectiveness of Diabetes Self-Management Education on Distress and HbA1C among Indian Type 2 Diabetes Mellitus Patients: A Randomized Controlled Trial. Indian J Community Med. 2023;48(5):702-708. doi:10.4103/ijcm.ijcm_843_22

[31] Shuvo SD, Hossen MT, Riazuddin M, et al. Prevalence of comorbidities and its associated factors among type-2 diabetes patients: a hospital-based study in Jashore District, Bangladesh [published correction appears in BMJ Open. 2023 Sep 29;13(9):e076261corr1. doi: 10.1136/bmjopen-2023-076261corr1.]. BMJ Open. 2023;13(9):e076261. Published 2023 Sep 11. doi:10.1136/bmjopen-2023-076261

[32] Park, HS., Cho, Y., Seo, D.H. et al. Impact of diabetes distress on glycemic control and diabetic complications in type 2 diabetes mellitus. Sci Rep 14, 5568 (2024). https://doi.org/10.1038/s41598-024-55901-0

[33] Kasteleyn MJ, de Vries L, van Puffelen AL, et al. Diabetes-related distress over the course of illness: results from the Diacourse study. Diabet Med. 2015;32(12):1617-1624. doi:10.1111/dme.12743

[34] Zu, W., Zhang, S., Du, L. et al. The effectiveness of psychological interventions on diabetes distress and glycemic level in adults with type 2 diabetes: a systematic review and meta-analysis. BMC Psychiatry 24, 660 (2024). https://doi.org/10.1186/s12888-024-06125-z

[35] Gwyneth Rees, Fleur O'Hare, Marian Saeed, Bronwyn Sudholz, Bonnie A Sturrock, Jing Xie, Jane Speight, Ecosse L Lamoureux - Problem-solving therapy for adults with diabetic retinopathy and diabetes-specific distress: a pilot randomized controlled trial: BMJ Open Diabetes Research & Care 2017;5:e000307.]

[36] Sinha R, Priya A, Sinha A, Hifz Ur Rahman M. Prevalence of diabetes distress among type 2 diabetes mellitus patients in India: a systematic review and meta-analysis. Health Psychol Behav Med. 2024;12(1):2324091. Published 2024 Mar 5. doi:10.1080/21642850.2024.2324091