

Original Research Article

Diabetes distress and determinants of glycemic control among patients with type 2 diabetes mellitus- an analytical cross-sectional study in urban field practice area of a tertiary care centre in Nagpur

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ABSTRACT

Background: Diabetes mellitus (DM) is a global health concern with significant morbidity and mortality, particularly in India, where the prevalence is approximately 14.5% and projected to reach 80 million by 2030. Diabetes distress refers to the emotional burden and challenges of ongoing diabetes management and fear of complications. This study aimed to assess diabetes distress and identify factors influencing glycemic control among patients with type 2 diabetes mellitus (T2DM).

Methods: A cross-sectional study was conducted at the urban health training centre of a tertiary care hospital in Nagpur from February to June 2024. A total of 380 T2DM patients attending the outpatient department were screened using the diabetes distress screening scale (DDS). Patients identified with distress were further evaluated using the DDS-17 questionnaire to determine specific distress domains.

Results: Out of 380 screened, 240 participants were enrolled (mean age: 61.04 years). Poor glycemic control (HbA1c > 7%) was significantly more common in males (66.6%, $p=0.0037$) and in the 40-60 age group ($p=0.024$). Those with < 7 years diabetes duration had worse control ($p=0.017$). Moderate to severe distress was found in 41%, mainly regimen-related and emotional (36.36% each). Significant factors associated with poor control included monotherapy, infrequent follow-ups, sedentary lifestyle, smoking, family history, and inadequate diabetes knowledge.

Conclusions: Diabetes distress is prevalent among T2DM patients and is associated with poor glycemic control. Addressing distress and related factors is essential for better diabetes management outcomes.

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

INTRODUCTION

Diabetes mellitus (DM) continues to pose a formidable public health challenge globally, with its burden particularly pronounced in low- and middle-income countries such as India.¹ Characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both, diabetes mellitus (DM) significantly contributes to morbidity, disability, reduced quality of life, and premature mortality.¹ India, often referred to as the diabetes capital of the world, has a

rapidly growing diabetic population. The national prevalence of diabetes is approximately 8.9%, according to the International Diabetes Federation (IDF), while other sources estimate it to be as high as 14.5%.² This number is projected to rise dramatically, with an estimated 80 million individuals in India expected to be living with diabetes by the year 2030.³

Among the various psychosocial aspects of diabetes care, diabetes-related distress has garnered increasing attention. It refers to the emotional burdens and worries specific to

individuals living with diabetes and their experience in managing the disease.⁴ The American Diabetes Association (ADA) recognizes diabetes distress as a distinct entity encompassing concerns related to disease management, emotional burden, interpersonal stress, and dissatisfaction with healthcare providers and support systems.⁵ Diabetes distress can be assessed using validated tools such as the diabetes distress scale-17 (DDS-17), which captures distress across four domains: emotional burden, physician-related distress, interpersonal distress, and regimen-related distress.⁶

Research indicates that diabetes distress can negatively impact self-care behaviors, reduce adherence to medications, and result in suboptimal glycemic control. Effective management of type 2 diabetes mellitus (T2DM) relies heavily on maintaining optimal glycemic control to reduce the risk of long-term complications.^{7,8} Glycated hemoglobin (HbA1c) is widely recognized as the gold standard for assessing long-term glycemic status, reflecting average blood glucose levels over the past 2-3 months.⁹ Despite its proven utility, some studies assessing glycemic control have not incorporated HbA1c, potentially affecting the reliability of their findings.¹⁰

A range of factors- including sociodemographic characteristics, diabetes-related knowledge, treatment adherence, comorbidities, psychosocial stressors, and health system-related issues- can influence glycemic control.¹¹ However, the impact of these determinants varies across different population groups and healthcare contexts.¹²

Given the critical role of psychosocial well-being in diabetes self-management and the limited routine assessment of diabetes distress in clinical care, it is imperative to examine these dimensions in real-world settings- especially among urban populations utilizing secondary and tertiary healthcare services.¹³

Hence, the present study was undertaken in the urban field practice area of a tertiary care center in Nagpur to assess diabetes-related distress and explore factors influencing glycemic control, with HbA1c as the primary outcome measure. The objectives include evaluating diabetes distress among individuals with type 2 diabetes mellitus (T2DM) using the diabetes distress scale-17 (DDS-17) and identifying key sociodemographic, clinical, and behavioral determinants associated with glycemic control in this population.

METHODS

This analytical cross-sectional study was conducted at the urban health training centre (UHTC), which functions as a field practice area affiliated with a tertiary care centre in Nagpur. The study was carried out over a period of five months, from February 2024 to June 2024. The urban health centre caters to a diverse population, providing a

suitable setting to assess diabetes-related factors in a real-world primary care context.

The study population included patients diagnosed with type 2 diabetes mellitus (T2DM) who were attending the UHTC during the study period. Study subjects were selected based on specific inclusion and exclusion criteria. Individuals eligible for inclusion were those aged between 18 and 70 years, diagnosed with T2DM for a duration of more than one year, and who had a recent HbA1c test report- within three months of the interview date. Informed written consent was obtained from all participants before enrolment. Patients were excluded if they were diagnosed with type 1 diabetes, were pregnant, had any chronic medical or surgical illness other than diabetes, were undergoing long-term corticosteroid therapy, or were not willing to participate in the study.

The required sample size was calculated using the formula:

$$n = \frac{Z_{1-\alpha/2}^2 p(1-p)}{d^2}$$

Using a prevalence (p) of diabetes distress of 65.7% based on the study by Nagabhushana et al with a 6% absolute precision (d), and a 95% confidence level, the minimum sample size was estimated to be 240.²⁰ A convenience sampling technique was adopted for recruitment due to the feasibility and practical constraints in the field setting.

Data collection was conducted through regular visits to the urban health centre on outpatient days. Patients fulfilling the eligibility criteria were identified and approached. After establishing rapport and explaining the study's objectives, participants were interviewed using a pre-tested, semi-structured questionnaire. The questionnaire collected information on sociodemographic variables, clinical history, lifestyle factors, and other possible determinants of glycemic control such as adherence to treatment, dietary habits, physical activity, and comorbidities.

To assess diabetes-related distress, the diabetes distress scale-17 (DDS-17) was used, which evaluates distress across four domains: emotional burden, physician-related distress, regimen-related distress, and interpersonal distress. Each item in the scale is rated on a 6-point Likert scale, and domain-wise as well as overall distress scores were calculated.

All collected data were entered and compiled using Microsoft Excel (Microsoft 365). Before proceeding with statistical analysis, data cleaning and preliminary checks were carried out to ensure accuracy and consistency. Subsequently, the data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Appropriate statistical tests were applied to determine the association between diabetes distress and glycemic

control, as well as to identify potential determinants of poor glycemic control among the study participants. Ethical approval was obtained from the institutional ethics committee. Informed consent was obtained from all participants prior to data collection, ensuring confidentiality and voluntary participation.

RESULTS

A total of 240 participants were enrolled in the study. The mean age of study subjects was 61.04 years. Table 1 presents the association between sociodemographic variables and glycemic control, categorized by HbA1c values ($\leq 7\%$ as good control and $>7\%$ as poor control). A significantly higher proportion of males (66.6%) had poor glycemic control compared to females (33.4%) ($p=0.0037$). Age was significantly associated with glycemic status ($p=0.024$), with the highest proportion of poor control observed in the 40–60 years group (46.2%). Patients with a shorter duration of diabetes (<7 years) had significantly worse glycemic control (55.3%) compared to those with longer duration (≥ 7 years) ($p=0.017$).

Although overweight individuals showed higher prevalence of poor glycemic control, the association between BMI and glycemic status was not statistically significant ($p=0.09$).

Table 2 outlines key sociodemographic and clinical determinants of glycemic control. Poor control was significantly associated with: male sex ($p=0.0037$), Shorter duration of diabetes (<7 years) ($p=0.017$), type of treatment- those on monotherapy showed poorer control than those on combined oral hypoglycemic agents ($p=0.016$). Frequency of follow-up- poor control was more common in patients attending follow-up less

frequently, with the strongest association found in those reporting 3-monthly visits ($p<0.0001$)

This also shows sedentary individuals showed significantly worse glycemic control than physically active ones ($p=0.001$). Smokers also had a higher prevalence of poor control compared to non-smokers ($p=0.010$). Although alcohol consumption showed a trend toward poorer control, the association was not statistically significant ($p=0.11$).

Patients with a family history of diabetes were more likely to have poor glycemic control ($p<0.001$). Notably, diabetes-related knowledge showed a strong association with glycemic status: patients with inadequate knowledge were more likely to have poor control (59.8%) compared to those with adequate knowledge (40.1%) ($p<0.0001$).

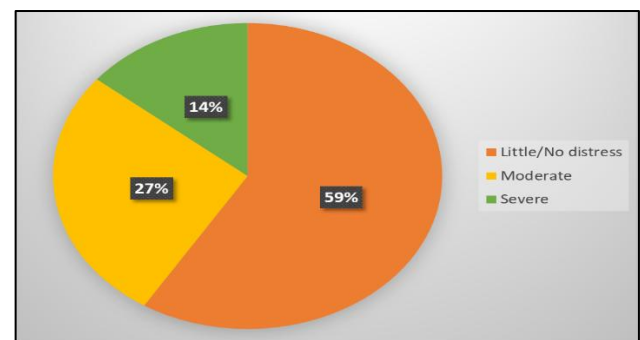


Figure 1: Diabetes distress among patients.

Figure 1 shows the distribution of diabetes distress among the study participants. A majority of patients (59%) experienced little or no distress. However, 27% had moderate distress, and 14% reported severe distress.

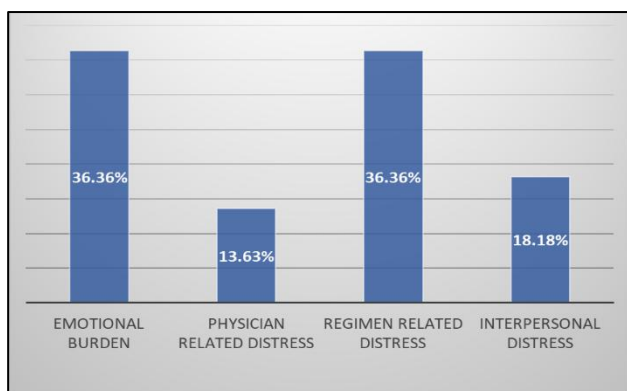
Table 1: Sociodemographic characteristics of the patients.

Variables		HbA1c ≤ 7 (%) (n=108)	HbA1c >7 (%) (n=132)	Chi-square value	P value
Gender	Male	52 (48.1)	88 (66.6)	8.381	0.0037
	Female	56 (51.8)	44 (33.4)		
Age (years)	<40	20 (18.5)	30 (22.7)	7.418	0.024
	40-60	36 (33.3)	61 (46.2)		
	>60	52 (48.1)	41 (31.0)		
Educational status	Graduate and above	30 (27.8)	28 (21.2)	3.809	0.148
	Primary to secondary	58 (53.7)	66 (50.0)		
	Illiterate	20 (18.5)	38 (28.8)		
Occupation	Employed	48 (44.4)	50 (37.9)	1.570	0.456
	Unemployed/retired	30 (27.8)	36 (27.3)		
	Homemaker	30 (27.8)	46 (34.8)		
BMI	Normal weight	84 (77.7)	93 (70.4)	4.749	0.09
	Overweight	14 (12.9)	31 (23.4)		
	Obese	10 (9.2)	8 (3.0)		
	No	95 (87.9)	86 (65.1)		

Table 2: Determinants of poor glycemic control.

Variables		HbA1c≤7 (%) (n=108)	HbA1c>7 (%) (n=132)	Chi- square value	P value
Gender	Male	52 (48.1)	88 (66.6)	8.381	0.003
	Female	56 (51.8)	44 (33.4)		
Duration of diabetes (years)	<7	43 (39.8)	73 (55.3)	5.706	0.017
	≥7	65 (60.1)	59 (44.6)		
Type of treatment	Monotherapy	59 (54.6)	92 (69.6)	5.779	0.016
	Combined OHA	49 (45.3)	40 (30.3)		
Frequency of checkup	Weekly	8 (7.40)	10 (7.5)	20.513	<0.0001
	Monthly	64 (59.2)	81 (61.3)		
	2 monthly	29 (26.8)	12 (9.0)		
	≥ 3 monthly	7 (6.4)	29 (21.9)		
Physical activity	Yes	86 (79.6)	79 (59.8)	10.818	0.001
	No	22 (20.3)	53 (40.1)		
Smoking	Yes	57 (52.7)	91 (68.9)	6.563	0.010
	No	51 (47.2)	41 (31.0)		
Alcoholism	Yes	18 (16.6)	13 (9.8)	2.454	0.11
	No	90 (83.3)	119 (90.1)		
Family history of diabetes	Yes	13 (12.0)	46 (34.8)	16.671	<0.001
	No	95 (87.9)	86 (65.1)		
Diabetes knowledge	Inadequate	27 (25)	79 (59.8)	29.252	<0.0001
	Adequate	81 (75)	53 (40.1)		

Figure 2 depicts the proportion of patients experiencing distress in each domain of the diabetes distress scale (DDS-17). Regimen-related distress and emotional burden were the most prominent, affecting 36.36% of participants each. Interpersonal distress and physician-related distress were reported by 18.18% and 13.63% of participants, respectively.

**Figure 2: Percentage of four domains in DDS-17.**

DISCUSSION

Although diabetes is a lifelong condition, blood glucose levels can be effectively managed through consistent day-to-day routines, adherence to prescribed medications, and appropriate lifestyle modifications. However, maintaining strict daily regimens and dietary restrictions- such as

avoiding sweets and high glycemic index foods- can contribute to psychological distress among individuals with diabetes. This was evident in our study, where distress was evaluated using the diabetes distress screening scale (DDS-17), highlighting the emotional burden associated with diabetes self-management and showed among the 4 domains emotional burden and regimen related distress had maximum proportion (36.36%).

The current study shows a moderate to high distress of 41% which is similar to a study done by Islam et al.¹⁴ where the proportion of people with moderate to high distress is 48.5% with higher impact of emotional burden and regimen distress. Both studies report moderate to high distress in a substantial proportion of T2DM patients, with Bangladesh having slightly higher prevalence. Both studies demonstrate a significant, positive association between diabetes distress and poor glycemic control ($p<0.001$). The current study shows higher age is significantly associated with poor glycemic control ($p=0.024$). This is similar to a study by Saghir et al that age >40 years had higher risk of getting poor glycemic control ($OR=2.4-2.6$, $p<0.01$).

The present study shows low physical activity significantly associated with poor glycemic control ($p=0.001$). This is in accordance with another study by Jayaprasad et al where low physical activity as a major risk factor for T2DM, with adjusted $OR=2.38$ (95% CI: 1.34-4.25), $p=0.003$.¹⁵ Both studies underline the critical

role of physical inactivity in the development and poor control of diabetes. While Jayaprasad et al found obesity to be a strong risk factor for onset, your study suggests a possible but weaker link with poor control among known diabetics.¹⁵

The current study shows patients with <7 years of diabetes had worse glycemic control, statistically significant ($p=0.017$). In another study by Ufuoma et al.¹⁶ It was observed that patients with a diabetes duration of more than 10 years had significantly poorer glycemic control ($p=0.003$). This result is similar to another study by Fiseha et al, where patients with ≥ 10 years of duration of diabetes had worse control with $p=0.013$ (AOR=2.20).¹⁷ All these studies show duration of diabetes is a significant determinant, although with opposite directionality- possibly due to population or sampling differences. The studies explained that BMI alone may not be a good predictor of glycemic control without considering central adiposity or insulin resistance.¹⁸

In a study by Saghir et al highlight clinical comorbidities (e.g., albuminuria, dyslipidemia), while your study emphasizes behavioral and psychosocial factors, including distress and knowledge.¹⁹ Both studies confirm that age, duration, and treatment modality are significantly associated with glycemic control.

CONCLUSION

This study highlights that diabetes distress is a significant concern among patients with type 2 diabetes mellitus, with 41% experiencing moderate to severe distress. Emotional burden and regimen-related issues were the most prominent domains. Poor glycemic control was significantly associated with factors such as male gender, shorter duration of diabetes, monotherapy, infrequent follow-up, sedentary lifestyle, smoking, family history of diabetes, and inadequate diabetes-related knowledge. These findings underscore the importance of routine screening for diabetes distress and the need for integrated interventions that address both clinical and psychosocial dimensions to achieve optimal glycemic control and improve patient outcomes.

Recommendations

Based on the findings of this study, it is recommended that routine screening for diabetes-related distress be integrated into clinical practice using validated tools such as the DDS-17. Early identification of emotional and regimen-related distress can help address psychosocial barriers to effective diabetes management. Secondly, strengthening patient education and counseling programs is essential to improve diabetes-related knowledge, promote adherence to treatment, and reduce misconceptions that contribute to distress. Lastly, promoting healthy lifestyle modifications- including regular physical activity, smoking cessation, and

consistent follow-up visits- should be prioritized through structured interventions, as these factors were significantly associated with better glycemic control.

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