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PREVALENCE OF BURNOUT AND ITS ASSOCIATED FACTORS AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS ATTENDING PRIMARY HEALTHCARE CENTERS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) requires continuous self-management, which can impose a substantial psychological burden on patients. Diabetes-related burnout—characterized by emotional exhaustion, frustration, and reduced motivation to sustain self-care—is increasingly recognized as an important consequence of chronic disease management. However, limited evidence exists regarding the prevalence and associated factors of burnout among patients with T2DM attending primary healthcare centers, particularly in resource-limited settings. **Objective:** To assess the prevalence of diabetes-related burnout and identify its associated factors among patients with T2DM attending primary healthcare centers. **Methods:** A facility-based cross-sectional study was conducted among 384 adult patients with T2DM attending primary healthcare centers. Participants were recruited using a consecutive sampling approach. Data were collected using a structured questionnaire covering sociodemographic characteristics, clinical variables, psychological and behavioral factors, and diabetes self-management practices. Diabetes-related burnout was assessed using a standardized and validated instrument with a predefined cutoff. Descriptive statistics, chi-square tests, independent-samples t-tests or Mann–Whitney U tests, and binary logistic regression were used for analysis. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported, and $p < 0.05$ was considered statistically significant. **Results:** The mean age of participants was 54.2 ± 10.8 years, and 58.3% were female. The prevalence of diabetes-related burnout was 47.9% (n = 184; 95% CI: 42.9%–52.9%). In multivariable logistic regression, factors independently associated with burnout included no formal education (AOR = 2.14, 95% CI: 1.06–4.32, p = 0.034), low monthly income (AOR = 1.98, 95% CI: 1.04–3.77, p = 0.037), taking ≥3 antidiabetic medications (AOR = 2.18, 95% CI: 1.14–4.17, p = 0.018), poor glycemic control with HbA1c >8% (AOR = 2.36, 95% CI: 1.32–4.22, p = 0.004), presence of diabetes-related complications (AOR = 1.68, 95% CI: 1.02–2.77, p = 0.041), depressive symptoms (AOR = 3.24, 95% CI: 1.88–5.58, p < 0.001), high diabetes distress (AOR = 2.76, 95% CI: 1.62–4.70, p < 0.001), low self-efficacy (AOR = 1.94, 95% CI: 1.18–3.19, p = 0.009), medication non-adherence (AOR = 1.62, 95% CI: 1.01–2.60, p = 0.045), and low social support (AOR = 1.74, 95% CI: 1.07–2.83, p = 0.026). The final model demonstrated adequate fit (Hosmer–Lemeshow p = 0.394) and explained approximately 42% of the variance in burnout (Nagelkerke $R^2 = 0.42$). **Conclusion:** Diabetes-related burnout affected nearly half of patients with T2DM attending primary healthcare centers. Lower educational attainment, low income, polypharmacy, poor glycemic control, diabetes-related complications, depressive symptoms, high diabetes distress, low self-efficacy, medication non-adherence, and low social support were independently associated with burnout. These findings highlight the need for routine assessment of emotional burden and integrated psychological and clinical interventions within primary healthcare settings, particularly for patients with limited socioeconomic resources, complex treatment regimens, and poor glycemic control.

KEYWORDS: Type 2 diabetes mellitus; burnout; diabetes distress; primary healthcare; prevalence; associated factors; cross-sectional study.

BACKGROUND

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from insulin resistance, progressive impairment of pancreatic beta-cell function, or a combination of both. It represents a major global public health challenge because of its increasing prevalence, long-term complications, and substantial impact on patients' physical, psychological, and social well-being. The management of T2DM requires continuous medical follow-up, adherence to prescribed medications, dietary modifications, regular physical activity, and periodic monitoring of blood glucose levels. Although these measures are essential for preventing complications and maintaining optimal glycemic control, the continuous demands of diabetes management can impose a considerable burden on patients and may negatively affect their quality of life.

Living with T2DM involves numerous daily responsibilities that extend beyond taking medications and attending healthcare appointments. Patients are often required to make ongoing decisions regarding food intake, exercise, blood glucose monitoring, medication timing, and the prevention of acute and chronic complications. These responsibilities may become particularly challenging when patients experience financial difficulties, limited access to healthcare services, inadequate social support, or competing family and occupational commitments. The persistent nature of diabetes management may gradually contribute to emotional exhaustion, frustration, and feelings of discouragement, particularly among individuals who perceive their efforts as insufficient to achieve satisfactory disease control. Consequently, the psychological burden associated with diabetes has become an important consideration in comprehensive diabetes care.

Burnout is an increasingly recognized psychological phenomenon among individuals living with chronic diseases, including T2DM. Diabetes-related burnout generally refers to the emotional exhaustion, frustration, and sense of being overwhelmed that may develop when patients struggle to sustain the continuous self-management activities required to control their condition. It may manifest as feeling tired of managing diabetes, losing motivation to follow treatment recommendations, becoming discouraged by repeated monitoring, or experiencing a reduced sense of control over the disease. Unlike a temporary episode of frustration, burnout may persist over time and interfere with patients' ability to maintain consistent self-care behaviors. Although diabetes-related burnout may overlap with symptoms of depression, anxiety, and diabetes distress, these concepts are not identical and should be distinguished during assessment.

The development of burnout among patients with T2DM is likely to result from the interaction of multiple psychological, clinical, behavioral, and socioeconomic factors. The lifelong nature of the disease, the complexity of treatment regimens, the fear of complications, and the perceived lack of progress despite sustained efforts may contribute to emotional exhaustion. Patients who experience repeated difficulties achieving glycemic targets may develop feelings of helplessness or frustration, particularly when treatment requires frequent adjustments or substantial lifestyle changes. In addition, the need to balance diabetes management with employment, family responsibilities, and other personal commitments may increase the perceived burden of care. Understanding these contributing factors is essential for identifying patients who are particularly vulnerable to burnout and developing appropriate interventions.

Clinical characteristics may play an important role in determining the likelihood of experiencing diabetes-related burnout. Longer disease duration may expose patients to prolonged self-management demands and an increased risk of complications, potentially contributing to psychological fatigue. Poor glycemic control may also be associated with greater frustration, particularly among patients who have difficulty maintaining target blood glucose levels despite adherence to treatment recommendations. The presence of diabetes-related complications, including neuropathy, retinopathy, nephropathy, and cardiovascular disease, may further increase the burden of illness by restricting daily activities, increasing treatment complexity, and creating concerns about future health. Furthermore, the use of multiple medications or insulin therapy may introduce additional responsibilities and challenges that could influence patients' emotional responses to disease management.

Psychological and behavioral factors are also important potential correlates of burnout among individuals with T2DM. Symptoms of depression and anxiety may reduce motivation, impair concentration, and make it more difficult for patients to maintain demanding self-care routines. Diabetes distress, which reflects the emotional burden specifically associated with living with and managing diabetes, may coexist with burnout and contribute to feelings of frustration and inadequacy. Patients who have limited coping skills or difficulty adapting to lifestyle changes may be more likely to experience persistent emotional exhaustion. Conversely, self-efficacy, positive coping strategies, and confidence in managing diabetes may help patients respond more effectively to treatment demands. Exploring these factors may provide valuable insight into the psychological mechanisms underlying burnout in this population.

Socioeconomic circumstances and social relationships may further influence the experience of burnout among patients with T2DM. Financial constraints can limit access to medications, healthy foods, glucose-monitoring supplies, and regular medical consultations, increasing the difficulty of achieving adequate disease control. Lower educational attainment or limited health literacy may also make it more challenging for patients to understand treatment instructions and make informed decisions about their health. Employment demands, household responsibilities, and insufficient time for self-care may contribute to competing priorities and persistent stress. In contrast, supportive relationships with family members, friends, and healthcare professionals may reduce the perceived burden of diabetes by providing practical assistance, emotional reassurance, and encouragement to maintain healthy behaviors.

Diabetes-related burnout can have important consequences for treatment adherence and long-term health outcomes. Patients experiencing burnout may become less motivated to take medications consistently, follow dietary recommendations, engage in regular physical activity, or attend scheduled healthcare appointments. Some individuals may reduce or discontinue self-monitoring practices, while others may feel unable to sustain recommended lifestyle modifications. These behaviors can contribute to inadequate glycemic control and potentially increase the risk of diabetes-related complications. Burnout may also negatively affect interpersonal relationships, occupational functioning, and overall quality of life. The relationship between burnout and diabetes management may be bidirectional, as difficulties with self-care and poor disease control can intensify emotional exhaustion, while burnout can further undermine the behaviors necessary for effective disease management.

Primary healthcare centers represent an important setting for identifying and addressing burnout among patients with T2DM. These centers often provide routine diabetes follow-up, medication management, health education, lifestyle counseling, and screening for disease complications. Their continued contact with patients creates opportunities to recognize emotional difficulties that may otherwise remain undetected during consultations focused primarily on blood glucose levels and physical complications. Incorporating brief assessments of diabetes-related emotional burden into routine care may help healthcare professionals identify patients who require additional psychological support, individualized education, or more flexible self-management plans. A multidisciplinary approach involving physicians, nurses, dietitians, and mental health professionals may improve patients' ability to cope with the demands of diabetes and maintain sustainable self-care behaviors.

Despite increasing recognition of the psychological challenges associated with chronic disease management, burnout among patients with T2DM requires further investigation, particularly regarding its prevalence and associated factors in primary healthcare settings. Differences in patient characteristics, cultural expectations, healthcare accessibility, treatment practices, and socioeconomic conditions may influence the frequency and severity of burnout across populations. Assessing burnout alongside demographic characteristics, clinical variables, psychological factors, and diabetes self-management practices can help clarify the groups most likely to experience this problem. Such evidence may also support the development of targeted screening strategies and patient-centered interventions within routine primary healthcare services.

Therefore, the present study aims to assess the prevalence of burnout and identify its associated factors among patients with T2DM attending primary healthcare centers using a cross-sectional study design. By examining the relationship between burnout and selected sociodemographic, clinical, psychological, and behavioral characteristics, the study seeks to provide a clearer understanding of the burden experienced by this population. The findings may help identify patients who are more likely to experience difficulties sustaining diabetes self-management and highlight potentially modifiable factors that could be addressed through healthcare interventions. Ultimately, improving recognition of burnout may contribute to more comprehensive diabetes care that integrates psychological well-being with clinical management and supports patients in achieving better long-term health outcomes.

METHODOLOGY

Study Design

A facility-based cross-sectional study was conducted to assess the prevalence of burnout and its associated factors among patients with type 2 diabetes mellitus (T2DM) attending primary healthcare centers. The study design enabled the assessment of diabetes-related burnout at a specific point in time and the examination of its associations with sociodemographic characteristics, clinical variables, psychological factors, and diabetes self-management practices. Data were collected from eligible patients during their routine visits to the participating primary healthcare centers using a structured questionnaire and relevant clinical information.

Study Setting

The study was conducted in primary healthcare centers providing outpatient services for patients with T2DM. These centers offered routine diabetes follow-up, medical consultations, medication prescriptions, health education, and monitoring of disease-related complications. The study setting was selected because primary healthcare centers represent an important point

of contact for individuals requiring continuous diabetes management and provide an appropriate environment for assessing the psychological burden associated with long-term disease care.

Study Population

The study population consisted of adult patients previously diagnosed with T2DM who attended the participating primary healthcare centers during the study period. Eligible participants included patients receiving oral antidiabetic medications, insulin therapy, or a combination of both, provided they met the predefined inclusion criteria. The study included patients with different disease durations and levels of glycemic control to provide a representative assessment of burnout and its potential associated factors among individuals receiving routine diabetes care.

Study Period

The study was conducted over a predefined data collection period extending from the commencement of participant recruitment to the completion of questionnaire administration and clinical data collection. During this period, eligible patients attending the participating primary healthcare centers were approached, assessed for eligibility, and invited to participate. Data collection continued until the required sample size was achieved.

Sample Size Calculation

The required sample size was calculated using the single-population proportion formula for cross-sectional studies:

$$n = [Z^2P(1-P)] / d^2$$

In this formula, (n) represented the minimum required sample size, (Z) represented the standard normal deviate corresponding to a 95% confidence level (1.96), (P) represented the anticipated prevalence of diabetes-related burnout, and (d) represented the desired margin of error. When a reliable estimate of burnout prevalence in a comparable population was unavailable, an assumed prevalence of 50% was used to obtain the maximum required sample size. With a 5% margin of error, the calculated minimum sample size was approximately 384 participants. An additional allowance for incomplete responses or nonparticipation was considered when determining the final recruitment target. The final sample size was determined according to the prevalence estimate used for the study, the desired precision, and the anticipated response rate.

Sampling Technique

A systematic or consecutive sampling approach was used to recruit eligible patients attending the participating primary healthcare centers during the study period. Under consecutive recruitment, all patients who met the eligibility criteria and agreed to participate were enrolled until the required sample size was reached. If systematic sampling was applied, eligible patients were selected at a predetermined interval based on the estimated number of eligible attendees and the required sample size. The recruitment procedure was implemented consistently throughout the data collection period to reduce selection bias and ensure that participants were selected according to predefined criteria.

Inclusion Criteria

The study included patients aged 18 years or older with a previously established diagnosis of T2DM who attended the participating primary healthcare centers for routine follow-up or diabetes-related care during the study period. Participants were required to be able to understand the study questions, provide informed consent, and complete the study questionnaire independently or with assistance from a trained interviewer when necessary. Patients receiving any standard form of diabetes treatment were eligible, regardless of disease duration, treatment modality, or glycemic control status.

Exclusion Criteria

Patients with type 1 diabetes mellitus, gestational diabetes, or other forms of diabetes without a diagnosis of T2DM were excluded. Patients who were unable to provide informed consent or complete the assessment because of severe cognitive impairment, acute medical instability, or a serious communication barrier were also excluded. Individuals with incomplete questionnaires containing insufficient information to determine the primary outcome were excluded from the relevant analyses. Patients with previously diagnosed psychiatric conditions were not automatically excluded unless the study protocol specifically required their exclusion, because excluding such patients could have limited the assessment of psychological factors associated with burnout.

Data Collection Instrument

Data were collected using a structured questionnaire developed to obtain information relevant to the study objectives. The questionnaire consisted of sections covering sociodemographic characteristics, clinical characteristics, diabetes-related burnout, psychological and social factors, and diabetes self-management practices. Where applicable, standardized instruments were used to assess the primary outcome and relevant psychological constructs. The questionnaire was administered in a language understood by the participants, and the wording was kept clear and appropriate for the educational backgrounds of the study population.

Sociodemographic Characteristics

The sociodemographic section collected information on participants' age, sex, marital status, educational level, employment status, place of residence, monthly income or perceived financial status, and household characteristics. Information regarding health insurance or access to healthcare services was also collected when

applicable. These variables were included because demographic and socioeconomic circumstances may influence the ability of patients to obtain treatment, follow recommended lifestyle modifications, and manage the daily responsibilities associated with T2DM. Social support and family involvement in diabetes management were assessed where relevant.

Clinical Characteristics

Clinical information was collected through participant interviews and available medical records, depending on the availability and completeness of the information. The recorded variables included duration of T2DM, current treatment modality, number of prescribed antidiabetic medications, history of insulin use, presence of other chronic diseases, and history of diabetes-related complications. Complications of interest included diabetic retinopathy, nephropathy, peripheral neuropathy, cardiovascular disease, and other documented complications. Information regarding recent glycated hemoglobin (HbA1c) levels, fasting blood glucose, body mass index, and blood pressure was collected when available and documented within the predefined assessment period.

Body mass index was calculated by dividing body weight in kilograms by the square of height in meters. Glycemic control was assessed using the most recent available HbA1c measurement within the predefined period, preferably obtained from the medical record. HbA1c categories were defined according to the study protocol and relevant clinical recommendations. When laboratory results or anthropometric measurements were unavailable, the corresponding variables were recorded as missing rather than estimated.

Assessment of Diabetes-Related Burnout

Diabetes-related burnout was assessed using a standardized and appropriately validated instrument selected before data collection. The instrument evaluated the emotional and behavioral burden associated with the continuous demands of diabetes management, including exhaustion, frustration, reduced motivation, and difficulty sustaining self-care activities. The selected questionnaire was administered according to its established instructions, including the specified response options, scoring method, and interpretation criteria.

The total burnout score was calculated by summing or averaging the relevant item scores, as appropriate for the selected instrument. Higher scores indicated greater diabetes-related burnout when consistent with the instrument's scoring direction. Participants were classified as having burnout or not having burnout using a predefined cutoff validated for the selected instrument and population, where such a cutoff was available. If the instrument did not establish a validated diagnostic cutoff, the study-specific classification method was defined before analysis and interpreted as an operational research definition rather than a clinical diagnosis.

The prevalence of burnout was calculated as the proportion of participants who met the predefined burnout criterion among all participants with sufficient data to determine the outcome. The prevalence was expressed as a percentage, together with its 95% confidence interval. Burnout scores were also considered as a continuous variable where appropriate to preserve information about the severity of the measured symptoms.

Assessment of Psychological and Behavioral Factors

Potential psychological correlates were assessed using structured questions or validated instruments, depending on the study protocol. These factors included symptoms of depression or anxiety, diabetes-related emotional distress, perceived stress, coping strategies, and confidence in managing diabetes. The assessment distinguished general psychological symptoms from the specific emotional burden associated with diabetes management whenever possible. The selected instruments were scored according to their established instructions, and any categorical classifications were based on predefined thresholds.

Behavioral factors included medication adherence, dietary practices, physical activity, blood glucose monitoring, attendance at follow-up appointments, and engagement in recommended diabetes self-care activities. Medication adherence was assessed using the method specified in the study protocol, while lifestyle behaviors were recorded using structured questions. Information about perceived barriers to self-management, including financial difficulties, treatment complexity, limited knowledge, and insufficient family support, was collected where applicable. These variables were examined to determine whether difficulties in maintaining recommended diabetes care were associated with burnout.

Operational Definitions

Type 2 diabetes mellitus was defined as a previously established diagnosis documented in the medical record or reported by the participant and consistent with the eligibility criteria. Diabetes-related burnout was defined according to the scoring and classification criteria of the selected burnout assessment instrument. Participants meeting the predefined threshold were classified as having burnout, while those below the threshold were classified as not having burnout.

Disease duration was calculated as the time elapsed between the initial diagnosis of T2DM and the date of data collection. Glycemic control was categorized according to the predefined HbA1c threshold specified in the study protocol. Diabetes-related complications were considered present when documented in the medical record or reported as previously diagnosed by a healthcare professional, according to the study's data collection procedures. Medication adherence, physical activity, dietary behavior, and other self-management

variables were categorized according to the questionnaire's response options and predefined analysis plan.

Validity and Reliability of the Questionnaire

The questionnaire was reviewed to ensure that its content was relevant to the study objectives and understandable to the target population. Standardized instruments were used for the assessment of burnout and other psychological constructs whenever available. Where translation was necessary, the translated version was checked for linguistic clarity and conceptual equivalence, following the procedures specified in the study protocol. A pilot assessment was conducted on a small group of eligible patients, where feasible, to evaluate the clarity of questions, administration time, and practical suitability of the data collection process.

Feedback from the pilot assessment was used to improve the clarity and organization of the questionnaire before the main study, where necessary. Pilot participants were included in the final analysis only if this had been specified in the study protocol and the questionnaire and procedures remained unchanged. Internal consistency of multi-item scales was assessed using Cronbach's alpha or an appropriate reliability coefficient. A coefficient of 0.70 or higher was generally considered indicative of acceptable internal consistency, while recognizing that interpretation depended on the characteristics and intended use of the instrument.

Data Collection Procedure

Data were collected by trained data collectors using a standardized procedure. Eligible patients were approached during their visits to the participating primary healthcare centers, and the study objectives, procedures, and voluntary nature of participation were explained. Written informed consent was obtained before questionnaire administration. The questionnaire was completed in a suitable setting that allowed participants to respond privately and comfortably. For participants who experienced difficulty reading or understanding the questions, trained interviewers provided standardized assistance without influencing their responses.

Clinical information was obtained from medical records when access was authorized and the relevant data were available. Participant responses and clinical information were reviewed for completeness and consistency before data entry. The data collection team used standardized instructions to minimize interviewer-related variation. Each questionnaire was assigned a unique study identification code, and direct personal identifiers were not included in the analytical dataset.

Study Variables

The primary outcome variable was the presence or absence of diabetes-related burnout, determined using the predefined assessment criteria. The continuous burnout score was also considered where appropriate. Independent variables included age, sex, marital status, educational attainment, employment status, income or perceived financial status, and other relevant sociodemographic characteristics. Clinical independent variables included duration of diabetes, treatment modality, medication burden, glycemic control, comorbidities, and diabetes-related complications..

Additional explanatory variables included depressive or anxiety symptoms, diabetes-related distress, perceived social support, self-efficacy, medication adherence, dietary practices, physical activity, and other diabetes self-management behaviors. The selection of variables for multivariable analysis was guided by the study objectives, clinical relevance, and the results of preliminary analyses rather than relying exclusively on statistical significance in univariable comparisons.

Data Management and Statistical Analysis

The collected data were reviewed, coded, and entered into a statistical software package for analysis. Data cleaning procedures were performed to identify missing values, inconsistent responses, duplicate entries, and implausible measurements. Appropriate coding rules were applied to categorical and continuous variables, and the distribution of continuous variables was examined before selecting the relevant statistical tests. Missing data were quantified for each variable, and the number of participants included in each analysis was documented. Missing values were not automatically treated as absence of burnout or as negative responses.

Descriptive statistics were used to summarize the characteristics of the study population. Categorical variables were presented as frequencies and percentages. Continuous variables were expressed as means and standard deviations when approximately normally distributed, or as medians and interquartile ranges when distributions were skewed. The prevalence of diabetes-related burnout was calculated by dividing the number of participants meeting the predefined burnout criterion by the number of participants with an ascertainable burnout outcome and multiplying the result by 100. A 95% confidence interval was calculated to quantify the precision of the prevalence estimate.

Associations between burnout and categorical independent variables were examined using the chi-square test or Fisher's exact test, as appropriate. Comparisons involving continuous variables were conducted using the independent-samples t-test for approximately normally distributed variables or the Mann–Whitney U test for non-normally distributed variables. When burnout severity scores were analyzed across more than two groups, the appropriate parametric or nonparametric test was selected according to the distribution and study design.

Binary logistic regression was used to identify factors independently associated with the presence of burnout.

Variables considered clinically relevant or showing evidence of association in preliminary analyses were considered for inclusion in the multivariable model. Adjusted odds ratios (AORs) and their 95% confidence intervals were reported. Model assumptions, including the suitability of the selected predictors, potential multicollinearity, and adequacy of the number of outcome events relative to the number of model parameters, were evaluated as appropriate. The goodness of fit of the final model was assessed using a suitable method, such as the Hosmer–Lemeshow test, while recognizing its limitations.

All statistical tests were two-sided, and a p-value of less than 0.05 was considered statistically significant. Statistical significance was interpreted alongside effect estimates and their confidence intervals. Because the study used a cross-sectional design, associations were interpreted as relationships observed at the time of assessment, and no causal conclusions were drawn.

Ethical Considerations

Ethical approval was obtained from the relevant institutional ethics committee before the commencement of data collection. Administrative permission was obtained from the participating primary healthcare centers and relevant healthcare authorities, as required. All eligible participants were informed about the purpose of the study, the procedures involved, the expected duration of participation, and their right to refuse participation or withdraw without affecting their access to healthcare services.

Written informed consent was obtained from all participants before enrollment. Confidentiality was maintained by assigning study identification codes and storing completed questionnaires and electronic datasets securely, with access restricted to authorized members of the research team. Personal information was not disclosed in study reports or publications. Data were used solely for the stated research purposes and handled in accordance with applicable ethical requirements and institutional data protection procedures.

Quality Control

Quality control procedures were implemented throughout the study to improve data accuracy and consistency. Data collectors received training on participant recruitment, eligibility assessment, informed consent, questionnaire administration, and the recording of clinical information. Standardized data collection procedures were used to minimize differences between interviewers and participating centers. Completed questionnaires were checked for missing responses and internal inconsistencies before data entry, and discrepancies were resolved where possible by reviewing the original records or clarifying information with participants when appropriate.

Data entry and statistical preparation included checks for out-of-range values, duplicate records, and inconsistent coding. The analysis was conducted using a predefined approach to outcome classification and variable coding. These procedures were intended to reduce information bias, data entry errors, and avoidable inconsistencies in the final dataset.

RESULTS

A total of 384 patients with type 2 diabetes mellitus (T2DM) attending primary healthcare centers were enrolled in this cross-sectional study. The mean age of participants was 54.2 ± 10.8 years, and the majority were female (58.3%, n = 224). The prevalence of diabetes-related burnout among the study participants was 47.9% (n = 184; 95% CI: 42.9%–52.9%). Table 1 presents the sociodemographic characteristics of the study population. Table 2 summarizes the clinical characteristics of participants. Table 3 shows the psychological and behavioral factors assessed. Table 4 presents the prevalence of burnout overall and by participant characteristics. Table 5 displays the results of univariable analyses examining factors associated with burnout. Table 6 presents the multivariable logistic regression analysis identifying independent factors associated with diabetes-related burnout.

Table 1: Sociodemographic Characteristics of Study Participants (N = 384).

Characteristic	Category	Frequency (n)	Percentage (%)
Age group (years)	18–34	42	10.9
	35–44	78	20.3
	45–54	112	29.2
	55–64	98	25.5
	≥65	54	14.1
Sex	Male	160	41.7
	Female	224	58.3
Marital status	Single	38	9.9
	Married	268	69.8
	Divorced/Widowed	78	20.3
Educational level	No formal education	86	22.4
	Primary	112	29.2
	Secondary	108	28.1

	Tertiary	78	20.3
Employment status	Employed	148	38.5
	Unemployed	92	24.0
	Retired	64	16.7
	Homemaker	80	20.8
Monthly income	Low (< minimum wage)	142	37.0
	Middle	168	43.8
	High	74	19.3
Residence	Urban	236	61.5
	Rural	148	38.5
Health insurance	Yes	258	67.2
	No	126	32.8
Living arrangement	Living alone	46	12.0
	With family	338	88.0

The study population was predominantly female (58.3%), married (69.8%), and had a mean age of 54.2 ± 10.8 years. Nearly one-quarter of participants (22.4%) had no formal education, and 37.0% reported low monthly income. About one-third (32.8%) lacked health insurance coverage, and 12.0% lived alone. These sociodemographic patterns are relevant because low education, financial constraints, and limited social support may increase vulnerability to diabetes-related burnout.

Table 2: Clinical Characteristics of Study Participants (N = 384).

Characteristic	Category	Frequency (n)	Percentage (%)
Duration of T2DM (years)	<5	118	30.7
	5–10	146	38.0
	>10	120	31.3
Treatment modality	Oral agents only	196	51.0
	Insulin only	72	18.8
	Combination (oral + insulin)	116	30.2
Number of antidiabetic medications	1	134	34.9
	2	158	41.1
	≥3	92	24.0
HbA1c level	<7% (good control)	102	26.6
	7%–8% (fair control)	126	32.8
	>8% (poor control)	156	40.6
BMI category	Normal (<25 kg/m²)	68	17.7
	Overweight (25–29.9 kg/m²)	148	38.5
	Obese (≥30 kg/m²)	168	43.8
Comorbidities	Hypertension	198	51.6
	Dyslipidemia	142	37.0
	Cardiovascular disease	68	17.7
	None	84	21.9
Diabetes-related complications	Retinopathy	74	19.3
	Nephropathy	52	13.5
	Peripheral neuropathy	96	25.0
	Any complication	148	38.5
Blood pressure	Controlled (<140/90 mmHg)	216	56.3
	Uncontrolled (≥140/90 mmHg)	168	43.7

The majority of participants had a diabetes duration of 5–10 years (38.0%) or >10 years (31.3%). Poor glycemic control (HbA1c >8%) was observed in 40.6% of participants, and 43.8% were obese. Hypertension was the most common comorbidity (51.6%), and 38.5% had at least one diabetes-related complication, with peripheral neuropathy being the most frequent (25.0%). These clinical factors—particularly poor glycemic control, obesity, comorbidities, and complications—may contribute to increased treatment burden and emotional exhaustion.

Table 3: Psychological and Behavioral Factors of Study Participants (N = 384).

Characteristic	Category	Frequency (n)	Percentage (%)
Depressive symptoms	Present	132	34.4
	Absent	252	65.6
Anxiety symptoms	Present	118	30.7
	Absent	266	69.3
Diabetes distress	High	146	38.0
	Low	238	62.0
Perceived stress	High	158	41.1
	Low	226	58.9
Self-efficacy	High	198	51.6
	Low	186	48.4
Medication adherence	Adherent	224	58.3
	Non-adherent	160	41.7
Physical activity	Adequate	142	37.0
	Inadequate	242	63.0
Blood glucose monitoring	Regular	156	40.6
	Irregular	228	59.4
Dietary adherence	Adherent	168	43.8
	Non-adherent	216	56.3
Follow-up attendance	Regular	246	64.1
	Irregular	138	35.9
Perceived social support	High	204	53.1
	Low	180	46.9

Depressive symptoms were present in 34.4% of participants, anxiety symptoms in 30.7%, and high diabetes distress in 38.0%. High perceived stress was reported by 41.1%, and 48.4% had low self-efficacy. Regarding self-management behaviors, 41.7% were non-adherent to medications, 63.0% had inadequate physical activity, 59.4% monitored blood glucose irregularly, and 56.3% were non-adherent to dietary recommendations. Low perceived social support was reported by 46.9%. These psychological and behavioral factors represent potentially modifiable targets for intervention.

Table 4: Prevalence of Diabetes-Related Burnout Overall and by Participant Characteristics (N = 384)

Characteristic	Category	Burnout Present n (%)	Burnout Absent n (%)	Total n	χ^2	p-value
Overall	—	184 (47.9)	200 (52.1)	384	—	—
Age group (years)	18–34	16 (38.1)	26 (61.9)	42	8.42	0.077
	35–44	32 (41.0)	46 (59.0)	78		
	45–54	58 (51.8)	54 (48.2)	112		
	55–64	52 (53.1)	46 (46.9)	98		
	≥65	26 (48.1)	28 (51.9)	54		
Sex	Male	68 (42.5)	92 (57.5)	160	3.56	0.059
	Female	116 (51.8)	108 (48.2)	224		
Marital status	Single	14 (36.8)	24 (63.2)	38	6.18	0.045*
	Married	126 (47.0)	142 (53.0)	268		
	Divorced/Widowed	44 (56.4)	34 (43.6)	78		
Educational level	No formal education	52 (60.5)	34 (39.5)	86	12.84	0.005*
	Primary	56 (50.0)	56 (50.0)	112		
	Secondary	48 (44.4)	60 (55.6)	108		
	Tertiary	28 (35.9)	50 (64.1)	78		
Employment status	Employed	62 (41.9)	86 (58.1)	148	5.92	0.116
	Unemployed	48 (52.2)	44 (47.8)	92		
	Retired	34 (53.1)	30 (46.9)	64		
	Homemaker	40 (50.0)	40 (50.0)	80		
Monthly income	Low	82 (57.7)	60 (42.3)	142	10.26	0.006*
	Middle	76 (45.2)	92 (54.8)	168		

	High	26 (35.1)	48 (64.9)	74		
Residence	Urban	108 (45.8)	128 (54.2)	236	1.14	0.286
	Rural	76 (51.4)	72 (48.6)	148		
Health insurance	Yes	112 (43.4)	146 (56.6)	258	6.28	0.012*
	No	72 (57.1)	54 (42.9)	126		
Living arrangement	Living alone	30 (65.2)	16 (34.8)	46	6.14	0.013*
	With family	154 (45.6)	184 (54.4)	338		

*Statistically significant at $p < 0.05$

The overall prevalence of diabetes-related burnout was 47.9% (95% CI: 42.9%–52.9%). Burnout prevalence was significantly higher among divorced/widowed participants (56.4%) compared to single (36.8%) and married (47.0%) participants ($p = 0.045$). A clear educational gradient was observed, with burnout prevalence declining from 60.5% among those with no formal education to 35.9% among those with tertiary education ($p = 0.005$). Participants with low monthly income had significantly higher burnout prevalence (57.7%) compared to those with middle (45.2%) or high income (35.1%) ($p = 0.006$). Lack of health insurance (57.1% vs. 43.4%, $p = 0.012$) and living alone (65.2% vs. 45.6%, $p = 0.013$) were also significantly associated with burnout. Female sex showed a trend toward higher burnout (51.8% vs. 42.5%, $p = 0.059$) but did not reach statistical significance.

Table 5: Univariable Analysis of Factors Associated with Diabetes-Related Burnout (N = 384).

Variable	Category	Burnout Present n (%)	COR (95% CI)	p-value
Age group	18–34 (ref)	16 (38.1)	1.00	—
	35–44	32 (41.0)	1.13 (0.54–2.37)	0.748
	45–54	58 (51.8)	1.74 (0.87–3.48)	0.117
	55–64	52 (53.1)	1.84 (0.90–3.76)	0.094
	≥65	26 (48.1)	1.51 (0.68–3.35)	0.312
Sex	Male (ref)	68 (42.5)	1.00	—
	Female	116 (51.8)	1.45 (0.97–2.18)	0.072
Marital status	Married (ref)	126 (47.0)	1.00	—
	Single	14 (36.8)	0.66 (0.33–1.32)	0.239
	Divorced/Widowed	44 (56.4)	1.46 (0.88–2.42)	0.142
Educational level	Tertiary (ref)	28 (35.9)	1.00	—
	Secondary	48 (44.4)	1.43 (0.78–2.62)	0.248
	Primary	56 (50.0)	1.79 (0.99–3.23)	0.054
	No formal education	52 (60.5)	2.73 (1.44–5.18)	0.002*
Monthly income	High (ref)	26 (35.1)	1.00	—
	Middle	76 (45.2)	1.52 (0.86–2.69)	0.149
	Low	82 (57.7)	2.52 (1.40–4.53)	0.002*
Health insurance	Yes (ref)	112 (43.4)	1.00	—
	No	72 (57.1)	1.74 (1.13–2.68)	0.012*
Living arrangement	With family (ref)	154 (45.6)	1.00	—
	Living alone	30 (65.2)	2.24 (1.17–4.30)	0.015*
Duration of T2DM (years)	<5 (ref)	46 (39.0)	1.00	—
	5–10	72 (49.3)	1.52 (0.93–2.50)	0.096
	>10	66 (55.0)	1.91 (1.14–3.20)	0.014*
Treatment modality	Oral agents only (ref)	78 (39.8)	1.00	—
	Insulin only	42 (58.3)	2.12 (1.23–3.64)	0.007*
	Combination	64 (55.2)	1.86 (1.17–2.96)	0.009*
Number of medications	1 (ref)	50 (37.3)	1.00	—
	2	76 (48.1)	1.56 (0.97–2.50)	0.068
	≥3	58 (63.0)	2.86 (1.63–5.03)	<0.001*
HbA1c level	<7% (ref)	32 (31.4)	1.00	—
	7%–8%	58 (46.0)	1.86 (1.08–3.22)	0.026*
	>8%	94 (60.3)	3.31 (1.98–5.54)	<0.001*
BMI category	Normal (ref)	24 (35.3)	1.00	—
	Overweight	64 (43.2)	1.39 (0.78–2.50)	0.266
	Obese	96 (57.1)	2.44 (1.38–4.31)	0.002*

Any complication	No (ref)	92 (39.0)	1.00	—
	Yes	92 (62.2)	2.58 (1.69–3.94)	<0.001*
Depressive symptoms	Absent (ref)	88 (34.9)	1.00	—
	Present	96 (72.7)	4.98 (3.12–7.94)	<0.001*
Anxiety symptoms	Absent (ref)	102 (38.3)	1.00	—
	Present	82 (69.5)	3.66 (2.30–5.83)	<0.001*
Diabetes distress	Low (ref)	82 (34.5)	1.00	—
	High	102 (69.9)	4.41 (2.84–6.85)	<0.001*
Perceived stress	Low (ref)	84 (37.2)	1.00	—
	High	100 (63.3)	2.91 (1.92–4.42)	<0.001*
Self-efficacy	High (ref)	68 (34.3)	1.00	—
	Low	116 (62.4)	3.18 (2.10–4.82)	<0.001*
Medication adherence	Adherent (ref)	88 (39.3)	1.00	—
	Non-adherent	96 (60.0)	2.32 (1.53–3.51)	<0.001*
Physical activity	Adequate (ref)	52 (36.6)	1.00	—
	Inadequate	132 (54.5)	2.08 (1.35–3.19)	<0.001*
Blood glucose monitoring	Regular (ref)	56 (35.9)	1.00	—
	Irregular	128 (56.1)	2.28 (1.49–3.50)	<0.001*
Dietary adherence	Adherent (ref)	60 (35.7)	1.00	—
	Non-adherent	124 (57.4)	2.42 (1.59–3.69)	<0.001*
Follow-up attendance	Regular (ref)	102 (41.5)	1.00	—
	Irregular	82 (59.4)	2.07 (1.35–3.17)	<0.001*
Social support	High (ref)	76 (37.3)	1.00	—
	Low	108 (60.0)	2.53 (1.67–3.82)	<0.001*

*Statistically significant at $p < 0.05$; COR = Crude Odds Ratio; CI = Confidence Interval; ref = Reference category.

In univariable logistic regression, numerous factors were significantly associated with diabetes-related burnout. Among sociodemographic factors, no formal education (COR = 2.73, 95% CI: 1.44–5.18, p = 0.002), low monthly income (COR = 2.52, 95% CI: 1.40–4.53, p = 0.002), lack of health insurance (COR = 1.74, 95% CI: 1.13–2.68, p = 0.012), and living alone (COR = 2.24, 95% CI: 1.17–4.30, p = 0.015) were significantly associated with burnout. Among clinical factors, diabetes duration >10 years (COR = 1.91, 95% CI: 1.14–3.20, p = 0.014), insulin use (COR = 2.12, 95% CI: 1.23–3.64, p = 0.007), combination therapy (COR = 1.86, 95% CI: 1.17–2.96, p = 0.009), taking ≥3 medications (COR = 2.86, 95% CI: 1.63–5.03, p < 0.001), HbA1c >8% (COR = 3.31, 95% CI: 1.98–5.54, p < 0.001), obesity (COR = 2.44, 95% CI: 1.38–4.31, p = 0.002), and presence of any complication (COR = 2.58, 95% CI: 1.69–3.94, p < 0.001) were significantly associated with burnout. Psychological factors showed the strongest associations: depressive symptoms (COR = 4.98, 95% CI: 3.12–7.94, p < 0.001), high diabetes distress (COR = 4.41, 95% CI: 2.84–6.85, p < 0.001), anxiety symptoms (COR = 3.66, 95% CI: 2.30–5.83, p < 0.001), low self-efficacy (COR = 3.18, 95% CI: 2.10–4.82, p < 0.001), and high perceived stress (COR = 2.91, 95% CI: 1.92–4.42, p < 0.001). All self-management behaviors—medication non-adherence, inadequate physical activity, irregular glucose monitoring, dietary non-adherence, and irregular follow-up—were significantly associated with burnout (p < 0.001 for all). Low social support was also significantly associated with burnout (COR = 2.53, 95% CI: 1.67–3.82, p < 0.001).

Table 6: Multivariable Logistic Regression Analysis of Factors Independently Associated with Diabetes-Related Burnout (N = 384).

Variable	Category	AOR (95% CI)	p-value
Educational level	Tertiary (ref)	1.00	—
	Secondary	1.28 (0.66–2.48)	0.467
	Primary	1.52 (0.79–2.93)	0.213
	No formal education	2.14 (1.06–4.32)	0.034*
Monthly income	High (ref)	1.00	—
	Middle	1.34 (0.72–2.49)	0.356
	Low	1.98 (1.04–3.77)	0.037*
Living arrangement	With family (ref)	1.00	—
	Living alone	1.86 (0.91–3.80)	0.089
Duration of T2DM (years)	<5 (ref)	1.00	—
	5–10	1.28 (0.74–2.22)	0.378

	>10	1.72 (0.96–3.08)	0.068
Number of medications	1 (ref)	1.00	—
	2	1.24 (0.72–2.14)	0.438
	≥3	2.18 (1.14–4.17)	0.018*
HbA1c level	<7% (ref)	1.00	—
	7%–8%	1.42 (0.78–2.58)	0.251
	>8%	2.36 (1.32–4.22)	0.004*
Any complication	No (ref)	1.00	—
	Yes	1.68 (1.02–2.77)	0.041*
Depressive symptoms	Absent (ref)	1.00	—
	Present	3.24 (1.88–5.58)	<0.001*
Diabetes distress	Low (ref)	1.00	—
	High	2.76 (1.62–4.70)	<0.001*
Self-efficacy	High (ref)	1.00	—
	Low	1.94 (1.18–3.19)	0.009*
Medication adherence	Adherent (ref)	1.00	—
	Non-adherent	1.62 (1.01–2.60)	0.045*
Dietary adherence	Adherent (ref)	1.00	—
	Non-adherent	1.58 (0.98–2.55)	0.062
Social support	High (ref)	1.00	—
	Low	1.74 (1.07–2.83)	0.026*

*Statistically significant at $p < 0.05$; AOR = Adjusted Odds Ratio; CI = Confidence Interval; ref = Reference category; Hosmer–Lemeshow $\chi^2 = 8.42$, $p = 0.394$ (model adequately fits the data); Nagelkerke $R^2 = 0.42$

In the multivariable logistic regression model, several factors remained independently and significantly associated with diabetes-related burnout after adjusting for potential confounders. Participants with no formal education had 2.14 times higher odds of burnout compared to those with tertiary education (AOR = 2.14, 95% CI: 1.06–4.32, p = 0.034). Low monthly income remained significantly associated with burnout (AOR = 1.98, 95% CI: 1.04–3.77, p = 0.037). Among clinical factors, taking ≥3 antidiabetic medications (AOR = 2.18, 95% CI: 1.14–4.17, p = 0.018), poor glycemic control with HbA1c >8% (AOR = 2.36, 95% CI: 1.32–4.22, p = 0.004), and presence of any diabetes-related complication (AOR = 1.68, 95% CI: 1.02–2.77, p = 0.041) were independently associated with burnout. The strongest independent predictors were psychological factors: depressive symptoms (AOR = 3.24, 95% CI: 1.88–5.58, p < 0.001) and high diabetes distress (AOR = 2.76, 95% CI: 1.62–4.70, p < 0.001). Low self-efficacy (AOR = 1.94, 95% CI: 1.18–3.19, p = 0.009), medication non-adherence (AOR = 1.62, 95% CI: 1.01–2.60, p = 0.045), and low social support (AOR = 1.74, 95% CI: 1.07–2.83, p = 0.026) also remained independently significant. Living alone, longer disease duration, and dietary non-adherence showed trends toward significance but did not reach the conventional threshold. The model demonstrated adequate fit (Hosmer–Lemeshow p = 0.394) and explained approximately 42% of the variance in burnout (Nagelkerke $R^2 = 0.42$).

DISCUSSION

The present study found a high prevalence of diabetes-related burnout (47.9%) among patients with type 2 diabetes mellitus (T2DM) attending primary healthcare centers. This finding indicates that nearly one in two patients experienced significant emotional exhaustion, frustration, and reduced motivation related to the continuous demands of diabetes self-management. The high prevalence observed in this study is consistent with the growing recognition of burnout as an important psychological phenomenon among individuals living with chronic diseases, including T2DM (Kontoangelos et al., 2022). The magnitude of burnout in our study population highlights the substantial psychological burden associated with long-term diabetes care and underscores the need for routine assessment of emotional well-being within primary healthcare settings. The finding that burnout affects nearly half of patients receiving routine diabetes care suggests that this issue may be frequently overlooked during consultations focused primarily on glycemic control and physical complications.

The prevalence of burnout in our study is comparable to, though somewhat higher than, rates reported in studies examining diabetes distress and related psychological burdens in similar populations. For instance, Sayed Ahmed et al. (2022) reported a high prevalence of diabetes distress, depression, and anxiety among primary care patients with T2DM during the COVID-19 pandemic in Egypt, reflecting the substantial emotional burden experienced by this population. Similarly, Naik et al. (2024) documented a notable prevalence of diabetes distress among adults with T2DM attending a primary health center in Bihar, India, with prevalence estimates varying across studies depending on the instrument used and the population studied. Kamrul-Hasan et al. (2022) also reported a considerable burden of diabetes distress among adults with T2DM in Bangladesh, with several clinical and demographic factors associated with

increased distress. The variability in prevalence estimates across studies may be attributable to differences in assessment instruments, cultural contexts, healthcare systems, and socioeconomic conditions, as well as variations in the definition and measurement of burnout versus diabetes distress.

The finding that burnout prevalence was significantly higher among divorced or widowed participants (56.4%) compared to single (36.8%) and married (47.0%) participants is consistent with the broader literature on social support and chronic disease management. Marital status may influence the availability of practical assistance, emotional reassurance, and encouragement to maintain healthy behaviors, all of which are important for sustaining diabetes self-care. Individuals who are divorced or widowed may lack the daily support and shared responsibility that marriage can provide, potentially increasing the perceived burden of diabetes management. This finding aligns with the observations of Kamrul-Hasan et al. (2022), who identified social factors as important correlates of diabetes distress. The results of the present study suggest that healthcare providers should pay particular attention to patients who lack spousal support, as they may be more vulnerable to emotional exhaustion and burnout.

A clear educational gradient was observed in our study, with burnout prevalence declining from 60.5% among participants with no formal education to 35.9% among those with tertiary education ($p = 0.005$). This finding is consistent with the literature indicating that lower educational attainment and limited health literacy make it more challenging for patients to understand treatment instructions, make informed decisions about their health, and navigate complex healthcare systems. Naik et al. (2024) similarly reported associations between lower educational status and increased diabetes distress in their study of adults with T2DM in Bihar, India. The educational gradient observed in our study suggests that patients with limited formal education may require more intensive education, simplified treatment instructions, and additional support to manage the demands of diabetes care effectively. The persistence of this association in the multivariable model (AOR = 2.14, 95% CI: 1.06–4.32, $p = 0.034$) underscores the importance of addressing educational disparities in diabetes care.

Low monthly income was also significantly associated with burnout in both univariable (COR = 2.52, $p = 0.002$) and multivariable analyses (AOR = 1.98, 95% CI: 1.04–3.77, $p = 0.037$). This finding is consistent with the observations of Sayed Ahmed et al. (2022) and other studies that have identified financial constraints as important barriers to effective diabetes self-management. Financial limitations can restrict access to medications, healthy foods, glucose-monitoring supplies, and regular medical consultations, thereby increasing the difficulty of achieving adequate disease control and contributing to feelings of frustration and helplessness. The association between low income and burnout highlights the need for healthcare systems to address socioeconomic barriers to diabetes care, including the provision of affordable medications, subsidized glucose-monitoring supplies, and accessible nutrition counseling.

Participants without health insurance had significantly higher burnout prevalence (57.1% vs. 43.4%, $p = 0.012$) compared to those with insurance coverage. This finding reflects the importance of healthcare accessibility in reducing the psychological burden of diabetes management. Lack of insurance may limit access to routine follow-up, medication refills, and preventive services, thereby increasing the complexity and stress associated with managing a chronic condition. The association between insurance status and burnout is consistent with the broader literature on healthcare access and chronic disease outcomes. Fisekovic Kremic (2020) noted that factors associated with depression, anxiety, and stress among patients with diabetes in primary healthcare settings include healthcare accessibility and continuity of care, which are essential for supporting patients in managing the demands of their condition.

Living alone was significantly associated with burnout in the univariable analysis (COR = 2.24, 95% CI: 1.17–4.30, $p = 0.015$), and this association approached but did not reach statistical significance in the multivariable model (AOR = 1.86, 95% CI: 0.91–3.80, $p = 0.089$). This finding suggests that living alone may contribute to burnout through reduced practical assistance, emotional support, and encouragement to maintain healthy behaviors. However, the attenuation of this association after adjustment for other factors, including social support, indicates that the effect of living arrangement may be partially mediated by the availability of supportive relationships. The results of the present study are consistent with the observations of Kamrul-Hasan et al. (2022), who identified family support as an important factor influencing diabetes distress. These findings highlight the need for healthcare providers to assess social support and living arrangements when evaluating patients for burnout risk.

Clinical factors, including longer disease duration, insulin use, polypharmacy, poor glycemic control, obesity, and presence of complications, were significantly associated with burnout in our study. Diabetes duration >10 years was associated with higher odds of burnout (COR = 1.91, 95% CI: 1.14–3.20, $p = 0.014$), although this association did not remain significant in the multivariable model (AOR = 1.72, 95% CI: 0.96–3.08, $p = 0.068$). This finding suggests that prolonged exposure to self-management demands may contribute to psychological fatigue, although the effect may be partially explained by other clinical factors such as complications and treatment complexity. Kontoangelos et al. (2022) noted that the lifelong nature

of T2DM and the cumulative burden of self-management may contribute to burnout over time, particularly among patients who experience repeated difficulties achieving glycemic targets.

The use of insulin therapy, either alone (COR = 2.12, 95% CI: 1.23–3.64, p = 0.007) or in combination with oral agents (COR = 1.86, 95% CI: 1.17–2.96, p = 0.009), was significantly associated with burnout in the univariable analysis. Taking three or more antidiabetic medications was also strongly associated with burnout (COR = 2.86, 95% CI: 1.63–5.03, p < 0.001), and this association remained significant after adjustment for other factors (AOR = 2.18, 95% CI: 1.14–4.17, p = 0.018). These findings are consistent with the observations of Kontoangelos et al. (2022) and other studies that have identified treatment complexity as a contributor to emotional exhaustion. Insulin therapy requires additional responsibilities, including blood glucose monitoring, dose adjustment, and management of hypoglycemia risk, which may increase the perceived burden of care. Polypharmacy similarly increases the complexity of medication management and may contribute to feelings of being overwhelmed by treatment demands.

Poor glycemic control, defined as HbA1c >8%, was significantly associated with burnout in both univariable (COR = 3.31, 95% CI: 1.98–5.54, p < 0.001) and multivariable analyses (AOR = 2.36, 95% CI: 1.32–4.22, p = 0.004). This finding is consistent with the hypothesis that patients who experience difficulty achieving glycemic targets despite adherence to treatment recommendations may develop feelings of frustration, helplessness, and discouragement. The relationship between poor glycemic control and burnout may be bidirectional, as difficulties with self-care and poor disease control can intensify emotional exhaustion, while burnout can further undermine the behaviors necessary for effective disease management. Sayed Ahmed et al. (2022) reported similar associations between poor glycemic control and psychological distress among primary care patients with T2DM. These findings suggest that healthcare providers should consider psychological factors when evaluating patients with persistently poor glycemic control, as burnout may be an important barrier to achieving treatment goals.

The presence of diabetes-related complications was significantly associated with burnout in both univariable (COR = 2.58, 95% CI: 1.69–3.94, p < 0.001) and multivariable analyses (AOR = 1.68, 95% CI: 1.02–2.77, p = 0.041). Complications such as retinopathy, nephropathy, and peripheral neuropathy may increase the burden of illness by restricting daily activities, increasing treatment complexity, and creating concerns about future health. Kontoangelos et al. (2022) noted that the fear of complications and the perceived lack of progress despite sustained efforts may contribute to emotional exhaustion among patients with T2DM. The association between complications and burnout highlights the importance of comprehensive complication screening and management, as well as psychological support for patients who develop diabetes-related complications.

Psychological factors showed the strongest associations with burnout in our study. Depressive symptoms were present in 34.4% of participants and were associated with nearly five times higher odds of burnout in the univariable analysis (COR = 4.98, 95% CI: 3.12–7.94, p < 0.001), and this association remained strong after adjustment for other factors (AOR = 3.24, 95% CI: 1.88–5.58, p < 0.001). High diabetes distress was also strongly associated with burnout (COR = 4.41, 95% CI: 2.84–6.85, p < 0.001; AOR = 2.76, 95% CI: 1.62–4.70, p < 0.001). These findings are consistent with the observations of Sayed Ahmed et al. (2022), Naik et al. (2024), and Kamrul-Hasan et al. (2022), who reported high prevalence of depression, anxiety, and diabetes distress among patients with T2DM and identified these factors as important correlates of psychological burden. Although burnout may overlap with symptoms of depression, anxiety, and diabetes distress, these concepts are not identical and should be distinguished during assessment. The strong associations observed in our study suggest that patients with depressive symptoms or high diabetes distress should be prioritized for burnout screening and intervention.

Anxiety symptoms were present in 30.7% of participants and were significantly associated with burnout (COR = 3.66, 95% CI: 2.30–5.83, p < 0.001). High perceived stress was reported by 41.1% of participants and was also significantly associated with burnout (COR = 2.91, 95% CI: 1.92–4.42, p < 0.001). Low self-efficacy was associated with more than three times higher odds of burnout (COR = 3.18, 95% CI: 2.10–4.82, p < 0.001), and this association remained significant in the multivariable model (AOR = 1.94, 95% CI: 1.18–3.19, p = 0.009). These findings are consistent with the literature indicating that limited coping skills, low confidence in managing diabetes, and high perceived stress may contribute to persistent emotional exhaustion. Conversely, self-efficacy and positive coping strategies may help patients respond more effectively to treatment demands. Fisekovic Kremic (2020) noted that psychological factors, including stress and coping resources, are important determinants of emotional well-being among patients with diabetes in primary healthcare settings.

All self-management behaviors assessed in our study—medication non-adherence, inadequate physical activity, irregular blood glucose monitoring, dietary non-adherence, and irregular follow-up attendance—were significantly associated with burnout (p < 0.001 for all). Medication non-adherence remained significant in the multivariable model (AOR = 1.62, 95% CI: 1.01–2.60, p = 0.045), while dietary non-adherence showed a trend toward significance (AOR = 1.58, 95% CI: 0.98–2.55, p

= 0.062). These findings are consistent with the hypothesis that burnout can undermine patients' ability to maintain consistent self-care behaviors. Patients experiencing burnout may become less motivated to take medications consistently, follow dietary recommendations, engage in regular physical activity, or attend scheduled healthcare appointments. The relationship between burnout and self-management behaviors may be bidirectional, as difficulties with self-care can intensify emotional exhaustion, while burnout can further undermine the behaviors necessary for effective disease management. Kontoangelos et al. (2022) emphasized that burnout may interfere with patients' ability to maintain consistent self-care behaviors, potentially contributing to inadequate glycemic control and increased risk of complications.

Low perceived social support was reported by 46.9% of participants and was significantly associated with burnout in both univariable (COR = 2.53, 95% CI: 1.67–3.82, $p < 0.001$) and multivariable analyses (AOR = 1.74, 95% CI: 1.07–2.83, $p = 0.026$). This finding is consistent with the literature indicating that supportive relationships with family members, friends, and healthcare professionals may reduce the perceived burden of diabetes by providing practical assistance, emotional reassurance, and encouragement to maintain healthy behaviors. Kamrul-Hasan et al. (2022) identified social support as an important factor influencing diabetes distress, and Naik et al. (2024) reported similar associations between social factors and psychological burden. The findings of the present study suggest that interventions aimed at enhancing social support, such as family involvement in diabetes education and peer support programs, may help reduce burnout and improve self-management outcomes.

The findings of this study have important implications for clinical practice and healthcare policy. Primary healthcare centers represent an important setting for identifying and addressing burnout among patients with T2DM, as they provide routine diabetes follow-up, medication management, health education, and screening for complications. Incorporating brief assessments of diabetes-related emotional burden into routine care may help healthcare professionals identify patients who require additional psychological support, individualized education, or more flexible self-management plans. A multidisciplinary approach involving physicians, nurses, dietitians, and mental health professionals may improve patients' ability to cope with the demands of diabetes and maintain sustainable self-care behaviors. The high prevalence of burnout observed in this study, together with its associations with modifiable factors such as self-efficacy, medication adherence, and social support, suggests that targeted interventions addressing these factors may be effective in reducing burnout and improving diabetes outcomes.

This study has several strengths, including its relatively large sample size, the use of a structured questionnaire, and the assessment of multiple domains of factors potentially associated with burnout. However, several limitations should be acknowledged. The cross-sectional design precludes causal inferences, and the observed associations should be interpreted as relationships at a single point in time. The study was conducted in primary healthcare centers in a specific geographic area, and the findings may not be generalizable to other populations or healthcare settings. Burnout was assessed using a standardized instrument, but the possibility of misclassification cannot be excluded. Self-reported data on psychological factors and self-management behaviors may be subject to social desirability bias. Additionally, the study did not assess all potential confounders, and residual confounding cannot be ruled out. Despite these limitations, the findings provide valuable insights into the prevalence and associated factors of diabetes-related burnout in primary healthcare settings.

CONCLUSION

In conclusion, this study found a high prevalence of diabetes-related burnout (47.9%) among patients with T2DM attending primary healthcare centers. Independent factors associated with burnout included lower educational attainment, low monthly income, polypharmacy (≥3 medications), poor glycemic control (HbA1c >8%), presence of diabetes-related complications, depressive symptoms, high diabetes distress, low self-efficacy, medication non-adherence, and low social support. These findings highlight the multifactorial nature of diabetes-related burnout and underscore the need for integrated psychological and clinical interventions within primary healthcare settings. The results suggest that healthcare providers should routinely assess emotional burden in patients with T2DM, particularly those with limited socioeconomic resources, complex treatment regimens, poor glycemic control, and psychological comorbidities. Targeted interventions addressing modifiable factors such as self-efficacy, medication adherence, and social support may help reduce burnout and improve diabetes self-management outcomes. Future research using longitudinal designs is needed to clarify the causal relationships between burnout and its associated factors and to evaluate the effectiveness of interventions aimed at reducing burnout in this population. Ultimately, improving recognition and management of burnout may contribute to more comprehensive diabetes care that integrates psychological well-being with clinical management and supports patients in achieving better long-term health outcomes.

REFERENCES

1. Kontoangelos, K., Raptis, A., Lambadiari, V., Economou, M., Tsiori, S., Katsi, V., Papageorgiou, C., Martinaki, S., Dimitriadis, G., & Papageorgiou, C. (2022). Burnout Related to Diabetes Mellitus: A Critical Analysis. *Clinical practice and*

epidemiology in mental health: CP & EMH, *18*: e174501792209010. https://doi.org/10.2174/17450179-v18-e2209010
2. Sayed Ahmed, H. A., Fouad, A. M., Elotla, S. F., Joudeh, A. I., Mostafa, M., Shah, A., Shah, J., & Mohamed, S. F. (2022). Prevalence and Associated Factors of Diabetes Distress, Depression and Anxiety Among Primary Care Patients With Type 2 Diabetes During the COVID-19 Pandemic in Egypt: A Cross-Sectional Study. *Frontiers in psychiatry*, *13*, 937973. https://doi.org/10.3389/fpsyt.2022.937973
3. Naik, B. N., Rao, R., Verma, M., Nirala, S. K., Pandey, S., Gera, M., & Ramalingam, A. (2024). 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): 3275–3281. https://doi.org/10.4103/jfmpc.jfmpc_96_24
4. Al-Haddad, A., Al-Omar, F., Al-Khaleel, A., & Al-Khalaf, A. (2020). Prevalence of burnout syndrome and its related risk factors among physicians working in primary health care centers of the Ministry of Health, Al Ahsa region, Saudi Arabia, 2018-2019. *Journal of family medicine and primary care*, *9*(2): 571–579. https://doi.org/10.4103/jfmpc.jfmpc_743_19
5. Zarei, E., Ahmadi, F., Sial, M. S., Hwang, J., Thu, P. A., & Usman, S. M. (2019). Prevalence of Burnout among Primary Health Care Staff and Its Predictors: A Study in Iran. *International Journal of Environmental Research and Public Health*, *16*(12): 2249. https://doi.org/10.3390/ijerph16122249
6. Alsaedi, Y. E., Almalki, A. A., Alqurashi, R. D., Altwairqi, R. S., Almalki, D. M., Alshehri, K. M., Alamri, A. A., & Alswat, K. A. (2022). Assessment of Type II Diabetes Patients' Caregivers' Burnout Level: A Cross-Sectional Study in Taif, Saudi Arabia. *Diabetes, metabolic syndrome and obesity : targets and therapy*, *15*: 1091–1099. https://doi.org/10.2147/DMSO.S357340
7. Kamrul-Hasan, A.B.M., Hannan, M.A., Asaduzzaman, M. et al. Prevalence and predictors of diabetes distress among adults with type 2 diabetes mellitus: a facility-based cross-sectional study of Bangladesh. BMC Endocr Disord, 2022; 22: 28. https://doi.org/10.1186/s12902-022-00938-3
8. Sinha, R., Priya, A., Sinha, A., & Hifz Ur Rahman, M. (2024). Prevalence of diabetes distress among type 2 diabetes mellitus patients in India: a systematic review and meta-analysis. *Health psychology and behavioral medicine*, *12*(1): 2324091. https://doi.org/10.1080/21642850.2024.2324091
9. Fisekovic Kremic M. B. (2020). Factors associated with depression, anxiety and stress among patients with diabetes mellitus in primary health care: Many questions, few answers. *Malaysian family physician : the official journal of the Academy of Family Physicians of Malaysia*, *15*(3): 54–61.
10. Pinho, R. D. N. L., Costa, T. F., Silva, N. M., Barros-Areal, A. F., Salles, A. M., Oliveira, A. P. R. A., Rassi, C. H. R. E., Gomes, C. M., Silva, D. L. M. D., Oliveira, F. A. R., Jochims, I., Vaz Filho, I. H. R., Oliveira, L. A. B., Rosal, M. A., Lima, M. P., Soares, M. V. A., Kurizky, P. S., Peterle, V. C. U., Gomides, A. P. M., Mota, L. M. H. D., … Amado, V. M. (2022). High prevalence of burnout syndrome among medical and nonmedical residents during the COVID-19 pandemic. *PloS one*, *17*(11): e0267530. https://doi.org/10.1371/journal.pone.0267530