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The influence of therapeutic education on diabetes-related distress and therapeutic adherence among patients with type 2 diabetes in Tetouan, Morocco

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ABSTRACT

Introduction and aim. Diabetes-related distress is a prevalent issue that affects many patients, leading to challenges in adhering to treatment plans and lifestyle modifications. By implementing therapeutic education programs, healthcare providers seek to enhance patients' understanding of their condition, coping mechanisms, and treatment adherence. This study aims to explore the impact of therapeutic education on diabetes-related distress and therapeutic adherence among individuals diagnosed with type 2 diabetes.

Material and methods. This quasi-experimental study involved 40 patients with type 2 diabetes receiving therapeutic education during 6 Months from March 24 to September 30, 2022. Diabetes-related distress and adherence were assessed before and after the intervention using the Diabetes Distress Scale (DDS-17) and glycated hemoglobin (HbA1c) levels.

Results. Wilcoxon signed rank tests revealed statistically significant improvements for all measures after the intervention. Patients showed improved DDS-17 scores ($p < 0.001$) across all dimensions, and lower HbA1c levels ($p < 0.001$). Pre- and post-intervention mean difference across all measures show that the greatest improvements were seen in emotional distress (1.37) and treatment-related distress (1.2).

Conclusion. Therapeutic education had a positive impact on therapeutic adherence and diabetes-related distress. It should be an integral part of type 2 diabetes care protocols in Morocco.

Keywords. diabetes-related distress, therapeutic education, type 2 diabetes

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Introduction

Diabetes is a metabolic disease characterized by chronic hyperglycemia resulting from the body's inability to regulate blood sugar levels effectively. It is classified into two main forms: type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), with the latter accounting for approximately 80–90% of diabetic cases.[1] The World Health Organization (WHO) predicts that diabetes will rank as the sixth leading cause of death globally by the year 2030.[2] In 2021, diabetes caused 6.7 million deaths, with one death occurring approximately every five seconds.[3] Given its increasing prevalence and associated complications, diabetes poses a significant public health concern worldwide.[4,5]

Morocco is not exempt from this alarming global situation, as indicated by the rising prevalence of T2DM among Moroccan adults, reaching 12.4% in 2016.[6,7] Diabetes has been identified as the leading cause of end-stage chronic kidney failure and lower limb amputations in the country and is a major contributor to mortality, causing over 12,000 deaths annually and 32,000 deaths due to complications.[8,9]

Effective glycemic control, measured by maintaining a normal or near-normal glycated hemoglobin level (HbA1c<7%), is essential for reducing diabetes-related complications.[10] However, achieving this target remains challenging, with only 26.8% of Moroccan adult T2DM patients meeting the recommended HbA1c levels.[11] The key to successful management lies in patient adherence to therapeutic recommendations and active involvement in self-management.[12]

Furthermore, the biological marker for assessing glycemic control is HbA1c, which provides an estimate of blood glucose levels over the previous 60 to 90 days.[13] HbA1c is likely to be associated with adherence to medication and self-management. Several studies have shown that each 1% reduction in HbA1C is associated with a 21% reduction in the risk of diabetes-related complications.[14–17] Despite the importance of medication adherence in diabetes, it has been shown that worldwide adherence with diabetes treatment is between 38.5 to 93.1%.[18,19]

One crucial aspect affecting therapeutic adherence is diabetes-related distress (DD), encompassing concerns and anxieties associated with managing the demanding and restrictive nature of diabetes, potential complications and healthcare access.[20,21] High DD levels have been observed in approximately 36% of T2DM patients in community settings, with anxiety disorders being three times more prevalent compared to the general population.[22,23]

DD affects directly and indirectly blood sugar regulation by triggering stress hormones like cortisol and adrenaline, leading to hyperglycaemia.[24] Indirectly, DD associates with cognitive avoidance and impaired problem-solving, resulting in reduced healthy behavior adoption and compromised glycemic control.[24]

Addressing non-adherence requires an integrative approach targeting behavioral and emotional disease adaptation aspects.[24] Therapeutic education programs (TEP) have emerged as critical for equipping patients with the knowledge, skills, and behavioral changes necessary for effective diabetes management.[25] Few nursing studies have explored this, making this study relevant for nursing practice, particularly patient care. In Morocco, the national diabetes program focuses on strengthening TEP but standardized programs are yet to be established.[8]

Aim

To address this knowledge gap and enhance nursing interventions, this study assessed a TEP's impact on diabetes-related distress and glycemic control in T2DM patients in Tetouan, contributing to successful future nursing approaches in diabetes management.

Material and methods

Study design

This prospective quasi-experimental non-randomized uncontrolled study assessed a TEP's impact on diabetes-related distress and adherence among T2DM patients in Tetouan, Morocco. It was conducted at the Samsa Health Center, Medical Health Delegation of Tetouan, involving T2DM patients.

The 6-month study occurred from March 24, 2022 to September 30, 2022, with three phases:

Phase 1 – Pre-Test: Diabetes-related distress (Diabetes Distress Scale – DDS17) and glycemic control (HbA1c levels) were evaluated.

Phase 2 – Intervention: The TEP was implemented through four bimonthly group sessions (n=40) and 5 telephone follow-ups.

Phase 3 – Post-Test: Diabetes distress (DDS17) and glycemic control were reassessed.

Sampling

Convenience sampling recruited 40 participants meeting selection criteria, chosen during consultations based on appointment schedules. Eligibility included adult T2DM patients aged ≥18 years with ≥6-month diagnosis and HbA1c >7% or 53 mmol/mol attending the Samsa Health Center, reachable phone number, and ability to speak Moroccan Arabic. Exclusion criteria were type 1 diabetes, dementia, or significant communication difficulties, to focus on the population of interest and enhance validity and reliability.

Sample size calculation

Required sample size was calculated using G*Power 3.1.6. To compare data, the Wilcoxon test was used

with 0.91 power (1–β), 0.5 effect size (d), and 0.05 significance level (α). The total required sample size was 39, increased to 40 to ensure adequate power and account for potential attrition or data issues.

Data collection and assessment

Sociodemographic and medical characteristics were collected through questionnaires and medical records. The validated 17-item Diabetes Distress Scale (DDS-17), adapted and validated in Moroccan Arabic, assessed diabetes distress across four dimensions:[26,27]

Emotional distress: These items measures the emotional challenges and psychological distress associated with living with diabetes, including feelings of anxiety, depression, and the emotional impact of managing the condition.[28]

Physician-related distress: These items assesses distress related to interactions with healthcare providers, concerns about the quality of medical care, difficulties in communication and trust with healthcare professionals in the context of diabetes management.[28]

Regimen-related distress: evaluates the distress caused by the daily

management tasks associated with diabetes, such as taking medications, monitoring blood sugar levels, and following dietary and exercise recommendations.[28]

Interpersonal distress: It focuses on distress related to interactions with family, friends, and social relationships affected by diabetes, including concerns about how the condition impacts one's social life and support from loved ones.[28]

Responses were rated from 1 (not a problem) to 6 (very serious). Mean scores above 2 indicated moderate/severe distress.[29,30] The Cronbach's alpha coefficient was 0.86 for the total instrument.

Biological analysis

HbA1c levels were determined through high-performance latex immunoagglutination inhibition methodology with the Siemens DCA Vantage Analyzer of morning fasting blood samples.[31]

Educational intervention

The culturally sensitive TEP involved four weeklies 1.5-hour group sessions (N=40) and personalized 3 telephone follow-ups. It focused on patients' disease experiences, needs, and difficulties to address ambivalence and enhance self-efficacy, aiming to reduce distress and improve glycemic control. Workshops were conducted by a multidisciplinary team including a family doctor, psychologist, dietitian, psychoeducation nurse, and social worker, emphasizing active learning of cognitive and emotional aspects. Content was developed from validated international and national educational messages, expert consultations, brochures, and broadcasts.

Materials were adapted to the Arabic dialect and simplified. The holistic approach aimed to help patients adapt to complex, dynamic life situations.

A psychologist guided self-discovery and problem-solving to address self-care barriers, employing:

Cognitive restructuring

involves expressing the emotions associated with diabetes, with the aim of changing harmful beliefs and behaviors.

Illness acceptance and conservation commitment

Accepting diabetes restrictions and using religion as a coping mechanism. Motivational interviewing skills (empathy, understanding ambivalence/resistance) facilitated managing negative thoughts and establishing trust.

Follow-ups enabled patient responsibility for self-care through SMART goal-setting and self-management techniques to prevent relapses.

Data analysis

Descriptive statistics characterized variables. Categorical variables were presented as frequencies and percentages, quantitative variables as means and standard deviations. Wilcoxon signed-rank tests compared pre- and post-intervention means at a 0.05 significance level. Pre- and post-intervention mean differences were calculated. In the case of our study, we opted for the Wilcoxon ranked test to compare two paired groups when the data is not assumed to be normally distributed. Jamovi statistical software, version 2.3.16, was used for all data analyses in this study (https://www.jamovi.org/).

Ethics approval

Informed consent was obtained and ethics approval received from the institutional review board (University Hospital Center, Faculty of Medicine and Pharmacy of Tangier, Morocco, reference number 06/2022). Participant confidentiality was strictly maintained through anonymization and secure data storage. Authorization was also obtained from the Tetouan medical health delegation.

Results

Participant characteristics

Among the 40 participants, most were female (80%) aged 60–69 years (47.5%), married (70%), illiterate (70%), and had social insurance (76%). Most had a ≥5-year diabetes duration (35%), comorbidities (45%), family history of diabetes (50%), not enough information (65%), and oral antidiabetic treatment (93%) (Table 1).

Therapeutic education

Pre-intervention, the DDS-17 mean score was 2.72±0.88. Dimension means ranged from 3.26 ± 1.01 (emotional) to 1.73±0.85 (physician-related). Post-intervention, the

DDS-17 mean score was 1.73±0.38. Dimension means ranged from 1.89±0.48 (emotional) to 1.37±0.4 (physician-related). Wilcoxon tests found statistically significant pre-post improvement across all dimensions (p<0.001) (Table 2).

Table 1. Description of the sample characteristics (n=40)

Variable	Frequency n (%)
Sex (%)	
Male	8 (20%)
Female	32 (80%)
Age classes (%)	
<40	2 (5%)
40–49	6 (15%)
50–59	8 (20%)
60–69	19 (47.5%)
>69	5 (12.5%)
Level of education (%)	
Illiterate	28 (70%)
Can read and write	3 (7.5%)
Primary school	9 (22.5%)
Marital status (%)	
Single	2 (5%)
Married	28 (70%)
Divorced	2 (5%)
Widowed	8 (20%)
Social insurance (%)	
No	9 (22%)
Yes	31 (78%)
Diabetes duration on years (%)	
<1	5 (12.5%)
1-5	14 (35%)
6-10	11 (27.5%)
>10	10 (25%)
Comorbidities (%)	
Yes	18 (45%)
No	22 (55%)
Treatment (%)	
Oral antidiabetics	37 (93%)
Insulin	3 (7%)
Information on diabetes (%)	
Enough information	14 (35%)
Not enough information	26 (65%)
Family history (%)	
Yes	20 (50%)
No	20 (50%)

Table 2. Assessment of (DDS17) scale pre- and post-intervention

Tools	Pre-intervention	Post-intervention	p
Diabetes-related distress (DDS17)	2.72±0.88	1.73±0.38	<0.001
Emotional distress	3.26±1.01	1.89±0.48	<0.001
Physician-related distress	1.73±0.85	1.37±0.4	<0.001
Regimen-related distress	2.88±1.02	1.68±0.37	<0.001
Interpersonal distress	2 .89±1.47	2.01±0.92	<0.001

Pre-intervention, the (HbA1c) mean was 8.6% ± 1.6. Post-intervention, the HbA1c mean was

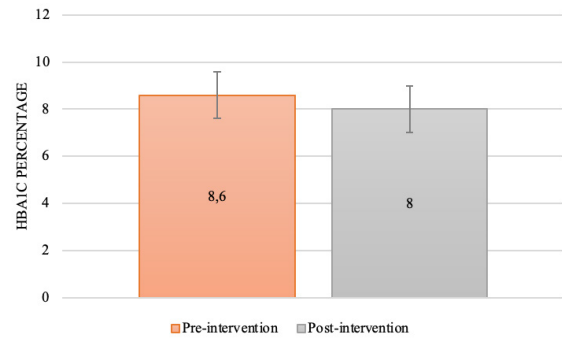8±1.2% Wilcoxon tests found statistically significant pre-post improvement, (p<0.001) (Figure 1).

Fig. 1. Assessment of therapeutic adherence through HbA1c levels pre- and post-intervention (***p<0.001)

The pre- and post-intervention mean difference across all measures show that the most marked improvements occurred for emotional distress (1.37) and regimen-related distress (1.2) (Figure 2).
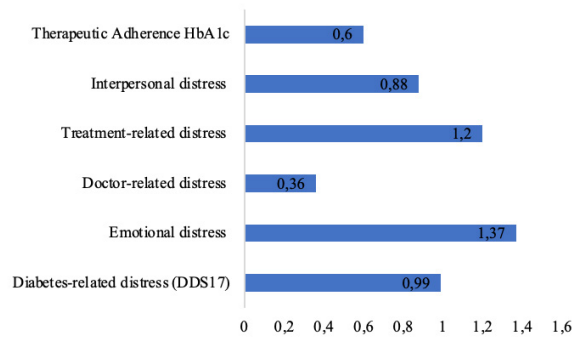

Fig. 2. Presentation of mean difference, pre and post-intervention

Discussion

In the present study, we observed a notable predominance of females, comprising 80% of the participants. This female preponderance aligns with expectations, as the study cohort was drawn from individuals with type 2 diabetes who were receiving care at the SAMSA Health Center. Previous reports have consistently shown that women tend to utilize healthcare services more frequently than men, a trend that is not unique to our setting and has been echoed in studies conducted in various other countries.[30-36] This phenomenon can likely be attributed to gender-related factors that contribute to distress.[36,37] Furthermore, women often shoulder greater responsibilities in diabetes care and face additional life and illness-related conflicts that can impact their problem-solving abilities, self-efficacy, and ultimately, glycemic control.[32,33] They may benefit from increased empowerment, gen-

der-sensitive approaches, and emotional interventions to address the distinctive challenges women encounter in managing diabetes and to mitigate distress.[32]

Post-intervention, considerable improvements occurred in emotional and regimen-related distress, consistent with other studies.[34–37] Simply discussing experiences, support, and services gave similar outcomes to TEP interventions, likely initiating sustainable behavior changes through increased self-efficacy and resilience based on personal value systems.[32,38]

Emotional and regimen-related distress improvements can be attributed to the psychological adjustment strategies employed, guided by a psychologist to enhance psychosocial adaptation and apply motivational interviewing techniques.[33,39]

Religion was highlighted as a coping strategy. Strategies aimed at improving self-esteem, self-efficacy, group membership and security. The care team helps patients to identify what is most important in their lives and to translate these values into specific, realistic and achievable goals.[40]

Nurses and patients adapt their treatments and self-management programs to achieve the identified collaborative goals to improve patient-centered outcomes.[41–43]

Glycemic control also improved significant, consistent with other studies which have confirmed that HbA1c is an essential measure to assess the level of adherence in people with diabetes.[32,38,44–46] The dynamic team-patient interaction created a supportive environment for understanding self-management strengths and challenges, which can reduce distress.[47] Nurses' health education roles contribute to resolve adherence problems and improve glycemic control.[48-50] Phone follow-ups enabled patient self-care responsibility through goal setting self-management techniques and glycaemic control.[51–53]

Conclusion

This study demonstrated a culturally sensitive, needs-based TEP improved diabetes-related distress and adherence by targeting patient autonomy, self-efficacy, problem-solving, and motivation. TEP should be integral to Moroccan T2DM care protocols. This is, to our knowledge, the first such study in Morocco showing TEP's usefulness in T2DM management. Further experimental, mixed methods studies over longer durations and with larger samples could extend these findings and provide greater insight into TEP's role in T2DM care.

Declarations

Author contributions:
Conceptualization, H.B. and A.T.; Methodology, A.T, M.M. and H.B.; Software, D.O., and H.B Validation, H.B., H.A and M.M.; Formal Analysis, H.B. and H.A.; H.B Investigation, H.B. and A.T Resources, H.B. and A.L Data Curation, H.B. and A.L.; Writing – Original Draft Preparation, H.B.; Writing – Review & Editing, H.B.; Visualization, H.B., H.B and H.A.; Supervision, A.T., Y.S. and M.M. Project Administration, Y.S.

Conflicts of interest
No conflict of interest was declared by the authors.

Data availability
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval
This study was approved by the local ethics committee (University Hospital Centre, Faculty of Medicine and Pharmacy of Tangier, Morocco, classified under the number 06/2022).

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