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# Assessment Of Cognitive Behavioral Therapy On Depression And Glycemic Control In Patients With Type 2 Diabetes Mellitus Attending Family Medicine Clinic, Suez Canal University Hospital: A Double Blinded Randomized Controlled Trial

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**Abstract**

**Introduction**: Diabetes is a long-term, progressive condition that affects people physically, socially, and psychologically. Diabetic patients are more likely to experience mental health issues, which can make self-care more challenging. By altering the way, they think and act, patients with diabetes may benefit from cognitive behavioral therapy (CBT), which has shown successful in treating a range of psychological conditions. **Aim**: To enhance the quality of life and health outcomes in diabetic patients experiencing depression. Objectives: To evaluate the impact of CBT on depressive symptoms and glycaemic regulation in individuals with type 2 diabetes mellitus. **Methodology**: A randomized controlled trial was done in family medicine clinic, Suez Canal university hospital, on diabetic patient with mild depression to examine the impact of CBT on depression as well as glycaemic control. Sample was randomly allocated into 2 equal groups. The intervention group offered CBT for 10 weeks, and the control group offered usual diabetic education. Depression was assessed through Beck inventory scale, while Glycaemic control was measured through measuring HBA1C pre-treatment, 3 months and 6 months post treatment. **Results**: depression symptoms were significantly reduced in CBT group compared to usual diabetic education group at 3 months and 6 months post treatment ($p < 0.001$). no significant difference was observed among the two groups regarding the glycaemic control at 3 months and 6 months post intervention ($p=0.525$, 0.504). pre- post treatment in CBT showed significant improvement in glycaemic control ($p<0.001$). Pre and post diabetic education revealed significant enhancement in glycaemic control ($p<0.001$). **Conclusion**: Cognitive behavioural therapy is beneficial in depressed diabetic patient.

**Keywords**: Cognitive behavioural therapy, depression, Glycaemic control, diabetes mellitus.

## INTRODUCTION:

In 2021, the estimated global prevalence of diabetes among individuals aged 20 to 79 years was 10.5%, expected to increase to 12.2% by 2045. The prevalence of diabetes was comparable between men and women, with the highest rates observed in individuals aged 75 to 79 years. In 2021, prevalence was predicted at 12.1% in urban areas, compared with 8.3% within rural areas, while it was 11.1% in high-income countries, relative to 5.5% in low-income countries. In 2021, global health expenditures associated with diabetes were estimated at 966 billion USD, with expectations indicating an increase to 1,054 billion USD by 2045. [1]

Type 2 diabetes mellitus (T2DM) is linked to depressive symptoms, and the presence of comorbid depression in individuals with T2DM correlates with negative clinical outcomes. Identifying and managing psychological symptoms present significant difficulties in type 2 diabetes mellitus (T2DM). Poorer outcomes of diabetes mellitus may be associated with major depressive episodes. [2]

Numerous studies have shown that CBT effectively reduces depressive symptoms in individuals with depression. Prior research indicates that cognitive behavioral group therapy (CBGT) is associated with a reduced rate of depression recurrence compared to standard care alone. CBGT primarily addresses patients' distorted and negative cognitive patterns. Modifying automatic thoughts along with dysfunctional attitudes can enhance psychological well-being by addressing cognitive distortions, increasing behavioral activation, and alleviating residual depression. With the assistance of a cognitive behavioral therapist, patients can recognize that various situations or stimuli may lead to the same incorrect beliefs. Early automatic thoughts of the patient can be modified to prevent dysfunctional attitudes. Altering dysfunctional attitudes can lead to a reduction in depression [3]

**AIM OF THE STUDY:**

This study was done to improve quality of life and disease outcomes of diabetic patients with depression.

**PATIENTS AND METHODS:**

**Study design:** The study was a randomized, double blind, controlled clinical trial Design:

**Study setting:** The study was carried out at the Family Medicine outpatient clinic affiliated with Suez Canal University hospitals serving the communities of Suez Canal and Sinai.

**Study population:** All patients with T2DM attending Family Medicine clinic, Suez Canal University Hospital.

**Study participants**: Type 2 diabetic patients suffering from mild to moderate depression attending the Family Medicine Outpatient Clinic.

**Inclusion criteria:**

Patients having T2DM ranged in age from 18 years to older. Both genders. Patients score 11–30 according to Beck depression index (BDI) (Mild to Moderate depression).

**Exclusion criteria:**

History of end-stage diseases (Liver cell failure, end stage renal disease). History of diagnosed Parkinson disease. History of dementia. History of psychiatric disorders except for depression. Patients with suicidal ideation. Depressed patients on treatment for depression. Patients with Substance or alcohol abuse.

Sample size:

The sample size estimation was done using this equation:

$$n = 2\left[\frac{\left(Z_{\propto\frac{}{2}} + Z_{\beta}\right) * \sigma}{\mu_1 - \mu_2}\right]^2$$

n = the minimum required sample size for each group. Zα/2 = 1.96 (The critical number that separates the core 95% of the Z distribution from the 5% in the tail). The critical number that divides the upper 80% of the Z distribution from the bottom 20% is Zβ = 0.84. σ represents the estimated standard deviation within the intervention group. 7.78 μ1 = 8.22 represents the mean change in depression within the intervention group. μ2 = 3.11 indicates the average change in depression within the control group. [4]

According to the previous data, the required sample size is 37 participants per group. After accounting for 20% non-response rate, 45 participants per group are required. Sample size was expanded to 50 participants per each group.

Sample size was calculated for each primary outcome and the largest sample was selected.

**PROCEDUERES:**

**Sampling techniques:**
Sample was chosen by non-probability convenient sampling technique from diabetic patients who were attending Family Medicine practice clinic affiliated with Suez Canal University hospitals. Under the inclusion and exclusion criteria, patients were recruited and organized into sample frames.

**Randomization**:
Eligible Patients were randomized in 1:1 ratio into either cognitive behavior therapy group or usual diabetic education group by simple randomization method. Envelopes with information about the designated group were distributed by the researcher responsible for the allocation. Ten Sessions of Cognitive Behavioral therapy were offered to intervention group individually by the main researcher. The Control group offered similar sessions of usual diabetic education for diabetes and depression without CBT.

**Blinding**:
The study was double blinded study, as our intervention is a type of psychotherapy, blinding was done by telling both groups that they will be offered talk therapy without clarification of cognitive behavior therapy or the usual health education for diabetes and depression. The second arm of blinding was done by asking another trained colleague to do the post intervention assessments of depression score in both groups without knowing the intervention and control group (blinded researcher).

**The Intervention**:
Ten Sessions of cognitive behavioral therapy were offered to intervention group individually by the main researcher after completing training courses in cognitive behavioral therapy and under supervision of psychiatry supervisor.
Frequency: One session per week. Length of session: 30-45 minutes. Method: Face to face meeting. Place: Family Medicine Clinic, Suez Canal University Hospital.(table1)

**Outcome measures**:
Primary outcome measure:
- Depression score through Beck inventory scale.
- Glycemic control through measuring HBA1C.

Secondary outcome measures:
- Adherence to diabetic treatment through history taking.

**Tools of the study**:
Data collection was from June 2024 to December 2024. A semi-structured questionnaire was used to evaluate each individual. An interviewer distributed the questionnaires.

**1. Interview Questionnaire:**
The questionnaire includes the following items:
1- . Personal data: name, age, gender, marital status, smoking (current or Ex-smoker) and phone number.
2- A validated scoring system of socio-economic status contains 7 domains. Depending on the determined quartiles, the total score out of 84 socioeconomic categories can be categorized as extremely low, low, moderate, or high. Each enrolled participant was requested about their education and cultural domain, occupational domain, familial domain, home sanitation domain, economic domain, as well as healthcare domain. Cronbach's alpha for scale was 0.66. [5]
3. Health status data: Beck Depression Inventory scale was used for scoring and determining of degree of depression. One of the most popular tools for measuring the prevalence and intensity of depression symptoms in both adults and adolescents is the Beck Depression Inventory-II (BDI-II). Based on the criteria outlined in the Diagnostic and Statistical Manual for Mental Disorders, the BDI-II is a 21-item self-report instrument that assesses symptoms of major depression. Scores indicated levels of depression,

with higher scores suggesting more severe cases. The Arabic version of the BDI-II has a high level of dependability and consistency. Between 0.82 to 0.93 is the range of coefficient alphas [6]

4- Known Self-reported medical history of having ever been diagnosed with other comorbid diseases other than diabetes (hypertension, osteoporosis, cardiac diseases, chronic obstructive pulmonary disease,

5- Known diagnosed complication of diabetes: diabetic nephropathy, retinopathy, neuropathy or cardiovascular complications.

6- Adherence to diabetic medication:

Morisky Medication Adherence Scale-8-item (MMAS-8). It is an eight-item valid single-dimensional measure. For the first seven questions, the answer is yes or no; for the last, there is a five-point Likert scale. The total score of MMAS ranges from 0 to 8, with greater scores showing better adherence. [7]

Scores below 6 on the MMAS indicate non-adherence in this study, whereas scores between 6 and 7 indicates medium adherence and scores of 8 indicate excellent adherence. The Arabic version demonstrated adequate internal consistency ($\alpha = 0.70$) along with moderate split-half reliability ($r = 0.65$). [8]

**2- Physical examination:**

1. Anthropometric measurements:

• Body mass index was calculated by measuring height and weight. Using meters for height and kilos for weight yields the most precise results.

• Both the pre- and post-intervention assessments were performed at the Suez Canal University Hospital's affiliated Family Medicine outpatient clinic.

• Body mass index (BMI): It was calculated as follows: weight in kilograms divided by height in meters squared.

2. Blood Pressure (BP):

Step 1: Proper patient preparation.

Step 2: Appropriate technique for BP measurements.

Step 3: Appropriate measurements required for diagnosis and treatment of high BP/hypertension were ensured:

Step 4: Appropriately, Accurate BP readings was recorded.

Step 5: Taking mean of readings was done.

Step 6: Give the patient their blood pressure measurements in writing and verbally [9].

3- Biochemical evaluation:

Assessment of HBA1C was requested for all intervention and control groups once before intervention and again after intervention 3 and 6 months from beginning of intervention.

Level of HBA1C will determine the level of glycemic control.

HBA1C is the main standard for evaluating glycated hemoglobin, and laboratories are advised to employ assay techniques for this test that are standardized according to the Diabetes Control and Complications Trial (DCCT) interpretation.

**STATISTICAL ANALYSIS:**

A computer was used to analyze the data, utilizing IBM SPSS software package version 20.0. Published by IBM Corp. in Armonk, New York. Numbers and percentages were used to describe the qualitative data. To ensure distribution normality, the Shapiro-Wilk test was employed. Standard deviation, median, interquartile range (IQR), range (minimum and maximum), and mean were used to characterize quantitative data. The acquired results were considered statistically significant at the 5% level.

The tests that were utilized were: Using a chi-square test to compare groups based on categorical factors, Fisher exact test for Modification to chi-square test when 20% or more of cells have predicted counts below 5, A Mann-Whitney U test. When comparing two groups that have quantitative variables with abnormally distributions, Friedman test. To compare more than two time periods or stages for quantitative variables with an abnormal distribution and Test for ad hoc comparisons (Dunn's) and

Coefficient of Spearman. To determine the correlation between two abnormally quantitative variables that are distributed.

**Ethical consideration:** The Ethics Committee of the Faculty of Medicine, Suez Canal University, approved the study. All participants in the study provided informed consent after being explained the goal of the study and the fact that they could withdraw at any time.

**Table 1: Self-structured program for the CBT which offered to intervention group.**

| Week | Focus area | Goals and activities |
|---|---|---|
| 1 | **1-Psychoeducation**<br><br>**2-Therapeutic journaling** | Understand the link between diabetes and depression. Learn how thoughts, emotions, and behaviors interact. (two ways discussion)<br>Patients record their thoughts and actions to identify patterns that may be harmful. Keeping a thought record. |
| 2 | **1-Mood Monitoring**<br><br>**2-Cognitive restructuring** | Track mood, energy, and blood sugar levels. Identify patterns and triggers.<br>After patients identify thought patterns in their thought records, they will be asked to evaluate their rationality and challenge them with more realistic thinking. |
| 3 | **1.Brainstorming/problem solving**<br><br>**2-Conduct a behavioural experiment** | consider every option, whether it might work or not.<br>evaluate his choices. What are the pros and cons. How will patient implement it?<br>Ask the patients to predict what will happen and then encourage them to conduct an experiment and try it. They are likely to find that the outcome is more positive than expected. |
| 4 | **1-Thought stopping**<br><br>**2-Exposure** | Wear a rubber band around the wrist and flick yourself when you find yourself ruminating. The brief sting takes your focus away from worries and helps client break the chain of rumination.<br>Patients must confront what they fear in order to learn that it will not harm them. |
| 5 | **1-Feelings charts**<br><br>**2-Relaxation** | list at least 16 different emotions with corresponding drawings of faces that exhibit said feelings.<br><br>Deep abdominal breathing, such as those done in yoga. Another commonly used CBT technique is progressive muscle relaxation. |
| 6 | **Activity scheduling** | Engage in something that you know will be good for you and write it down. |
| 7 | **Distraction** | Distract yourself when an urge occurs to engage in harmful behavior.<br>Take enough time for better decision. |
| 8 | **Successive approximation** | Break up a hard task into more manageable parts. |

| | | |
|---|---|---|
| 9 | **Mood thermometer** | A thermometer is drawn on a worksheet and, like a thermometer, it has different levels that signify increasing degrees of a particular emotion. |
| 10 | **Role play** | prepare for a situation where you feel unsure and have unhappy feeling. |

**RESULTS :**

A total of 100 patients were recruited to the study and divided to intervention group (50) and control group (50). The majority of participants were women (64% in the CBT group and 72% in the control group). Participants' mean ages in the CBT and control groups were 55.68 and 54.08 years, respectively. 76% and 82% of them are married. 58% and 56%, respectively, are illiterate. The most common occupations were retired, housewife, and non-working in the CBT and control groups (62% and 56%, respectively). The majority of respondents in the CBT and control groups (62% and 66%) lived in rural areas. Table 2

No significant difference between the two groups regarding their health status data. Diabetes complications affected 24% of patients in the CBT group and 34% of patients in the control group. Comorbidity was present in 66% of cases and 54% of cases. Smokers make up 20% of the control group and 24% of the CBT group. 60% of patients, both in the CBT and control groups, are on oral diabetic medications. Table 3

There was a highly significant improvement in depression scale in CBT group, while the control group did not significantly change, which is seen in the statistical significance difference in 3 and 6 months following the treatment ($p<0.001$). Improvement in depression scale started to be obvious in 3 months following treatment in comparison to pre-intervention assessment ($p= 0.002$) and lasts to 6months after the intervention ($p= 0.001$).Table 4

There is significant improvement in BDI score in the treatment group after intervention, however no change in the control group. Figure 1

The glycaemic control (HbA1c score) in the treatment group improved significantly at 3 and 6 months after the treatment ($p=0.006$, $p<0.001$) compared to pre-intervention, and the control group also demonstrated improvement in glycaemic control at 6 months after the treatment compared to the pre-treatment assessment ($p=0.041$). no significant difference was observed between the two groups. Table 5

Both groups' adherence significantly improved three and 6 months after the intervention compared to pre-treatment ($p<0.001$). But, there was no statistical difference between the two groups. Table 6

**Table 2: Comparison between the Cognitive behavioral therapy (CBT) and usual diabetic education groups regarding to socio-demographic characteristics**

| Personal data | CBT (n =50) | | Usual diabetic education (n =50) | | Test of Sig. | p |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Gender** | | | | | | |
| Male | 18 | 36.0 | 14 | 28.0 | $\chi^2$=0.735 | 0.391 |
| Female | 32 | 64.0 | 36 | 72.0 | | |
| **Age (years)** | | | | | | |
| 18- 45 | 8 | 16.0 | 15 | 30.0 | $\chi^2$= 3.242 | 0.356 |
| 46-55 | 20 | 40.0 | 14 | 28.0 | | |
| 56-65 | 12 | 24.0 | 12 | 24.0 | | |
| >65 | 10 | 20.0 | 9 | 18.0 | | |
| Min. – Max. | 34.0 – 80.0 | | 33.0 – 68.0 | | U= 1147.500 | 0.478 |
| Mean ± SD. | 55.68 ± 9.93 | | 54.08 ± 8.80 | | | |
| Median (IQR) | 55.0 (49.0 – 65.0) | | 55.0 (45.0 – 60.0) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Marital status** | | | | | | |
| Married | 38 | 76.0 | 41 | 82.0 | FET= 3.906 | 0.180 |
| Single | 4 | 8.0 | 0 | 0.0 | | |
| Widow | 8 | 16.0 | 9 | 18.0 | | |
| **Education Level** | | | | | | |
| Illiterate | 29 | 58.0 | 28 | 56.0 | $\chi^2$= 1.106 | $^{FE}$p= 0.885 |
| Read and write | 17 | 34.0 | 17 | 34.0 | | |
| Primary & Preparatory education | 2 | 4.0 | 4 | 8.0 | | |
| Secondary education- Intermediate | 2 | 4.0 | 1 | 2.0 | | |
| University- Postgraduate | 0 | 0.0 | 0 | 0.0 | | |
| **Occupation** | | | | | | |
| Non-working/ house wife/ Retired | 31 | 62.0 | 28 | 56.0 | $\chi^2$= 0.944 | $^{FE}$p= 0.900 |
| Unskilled manual | 11 | 22.0 | 11 | 22.0 | | |
| Skilled manual worker/farmer | 6 | 12.0 | 7 | 14.0 | | |
| Trades/business | 2 | 4.0 | 4 | 8.0 | | |
| Semi-professional. Clerk Professional | 0 | 0.0 | 0 | 0.0 | | |
| **Residence** | | | | | | |
| Rural | 31 | 62.0 | 33 | 66.0 | $\chi^2$=0.174 | 0.677 |
| Urban | 19 | 38.0 | 17 | 34.0 | | |

**Table 3: Comparison between the Cognitive behavioral therapy (CBT) and usual diabetic education groups regarding the health status characteristics**

| Variables | CBT (n =50) | | Usual diabetic education (n =50) | | $\chi^2$ | p |
|---|---|---|---|---|---|---|
| | No | % | No | % | | |
| **Complications** (neuropathy, nephropathy, retinopathy or cardiovascular) | | | | | | |
| Absent | 38 | 76.0 | 33 | 66.0 | 1.214 | 0.271 |
| Present | 12 | 24.0 | 17 | 34.0 | | |
| **Associated Comorbidities** (hypertension, obstructive lung disease, joint disorders) | | | | | | |
| Absent | 17 | 34.0 | 23 | 46.0 | 1.500 | 0.221 |
| Present | 33 | 66.0 | 27 | 54.0 | | |
| **Smoking** | | | | | | |
| Yes | 12 | 24.0 | 10 | 20.0 | 0.233 | 0.629 |
| No | 38 | 76.0 | 40 | 80.0 | | |
| Ex-smoker | 0 | 0.0 | 0 | 0.0 | | |
| **Substance abuse** | | | | | | |
| Yes | 0 | 0.0 | 1 | 2.0 | 1.010 | $^{FE}$p=1.000 |
| No | 50 | 100.0 | 49 | 98.0 | | |
| **BMI** | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Normal | 17 | 34.0 | 20 | 40.0 | | |
| Overweight | 17 | 34.0 | 12 | 24.0 | 1.223 | 0.543 |
| Obese | 16 | 32.0 | 18 | 36.0 | | |
| **Treatment** | | | | | | |
| Oral hypoglycemic drugs (OHD) | 30 | 60.0 | 30 | 60.0 | | |
| Insulin only | 0 | 0.0 | 0 | 0.0 | 0.000 | 1.000 |
| Insulin + OHD | 20 | 40.0 | 20 | 40.0 | | |

$\chi^2$: **Chi square test** **FET**: Fisher Exact Test
p: p value for comparing between the studied groups

**Table 4. Comparison between the Cognitive behavioral therapy (CBT) and usual diabetic education groups regarding to the level of Depression according Beck inventory (BDI)**

| BDI Score | CBT | | Usual diabetic education | | $\chi^2$ | P |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| **Pre- intervention** | (n = 50) | | (n = 50) | | | |
| Minimal | 0 | 0.0 | 0 | 0.0 | | |
| Mild | 41 | 88.0 | 44 | 88.0 | 0.000 | 1.000 |
| Moderate | 9 | 18.0 | 6 | 18.0 | | |
| Sever | 0 | 0.0 | 0 | 0.0 | | |
| **3 months after intervention** | (n = 50) | | (n = 49#) | | | |
| Minimal | 12 | 24.0 | 0 | 0.0 | | |
| Mild | 37 | 74.0 | 42 | 79.6 | 19.408* | <0.001* |
| Moderate | 1 | 2.0 | 7 | 20.4 | | |
| Sever | 0 | 0.0 | 0 | 0.0 | | |
| **6 months after intervention** | (n = 48#) | | (n = 48#) | | | |
| Minimal | 13 | 27.1 | 0 | 0.0 | | |
| Mild | 35 | 72.9 | 38 | 79.2 | 23.123* | <0.001* |
| Moderate | 0 | 0.0 | 10 | 20.8 | | |
| Sever | 0 | 0.0 | 0 | 0.0 | | |
| Fr ($p_0$) | 40.095* (<0.001*) | | 2.000 (0.368) | | | |
| $p_1$ | 0.002* | | – | | | |
| $p_2$ | 0.001* | | – | | | |
| $p_3$ | 0.878 | | – | | | |

$\chi^2$: Chi square test
Fr: Friedman test, Sig. bet. Periods were done using Post Hoc Test (Dunn's)
p: p value for comparing between the studied groups
$p_0$: p value for comparing between the studied periods in each group
$p_1$: p value for comparing between Pre and 3 months
$p_2$: p value for comparing between Pre and 6 months
$p_3$: p value for comparing between 3 months and 6 months
*: Statistically significant at $p \leq 0.05$
#: drop out case

**Figure 1**: **Comparison between the Cognitive behavioral therapy (CBT) and usual diabetic education groups regarding the level of Depression according Beck inventory (BDI) score.**

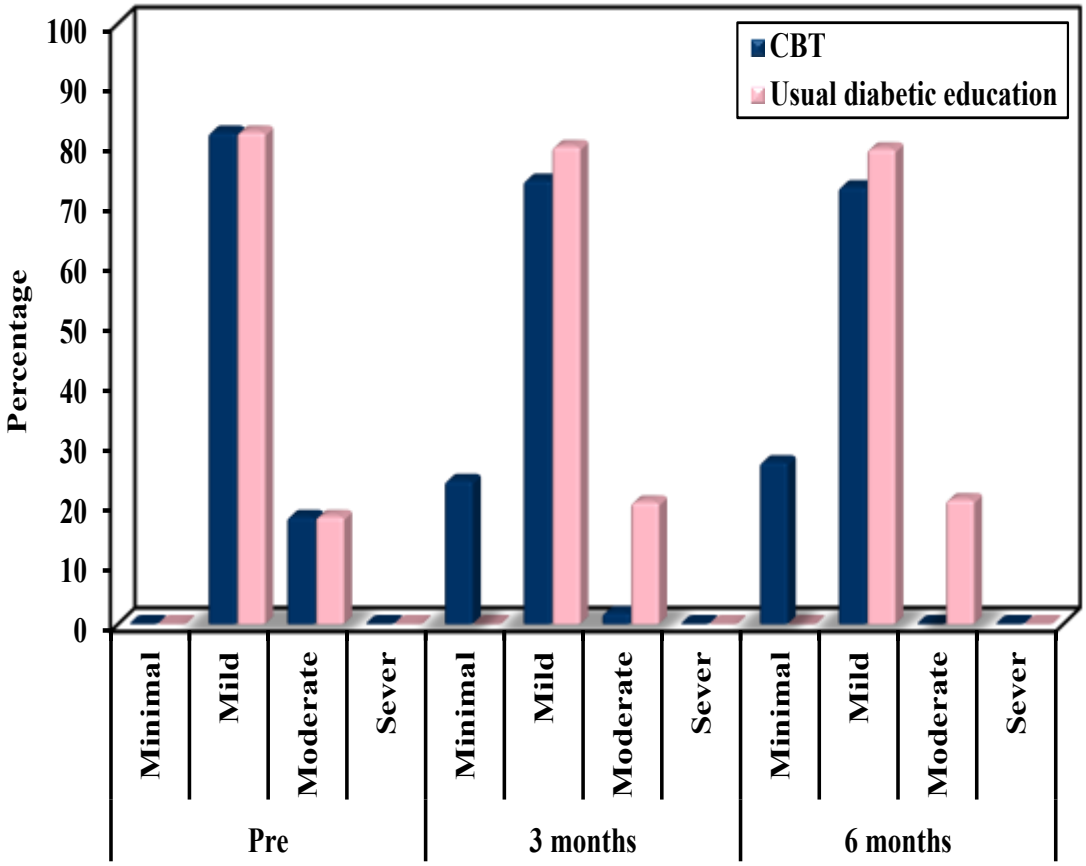


**Table 5.Comparison between Cognitive behavioral therapy (CBT) and usual diabetic education groups regarding the HbA1c score.**

| Glycemic control (HbA1c score) | CBT | Usual diabetic education | U | p |
|---|---|---|---|---|
| **Pre intervention** | (n = 50) | (n = 50) | | |
| Min – Max. | 7.0 – 13.90 | 7.0 – 10.0 | | |
| Mean ± SD. | 8.69 ± 1.39 | 8.44 ± 0.86 | 1211.50 | 0.784 |
| Median (IQR) | 8.25 (8.0 – 9.0) | 8.0 (8.0 – 9.0) | | |
| **3 months after intervention** | (n = 50) | (n = 49[#]) | | |
| Min – Max. | 7.0 – 13.90 | 7.0 – 10.0 | | |
| Mean ± SD. | 8.51 ± 1.32 | 8.32 ± 0.83 | 1213.50 | 0.935 |
| Median (IQR) | 8.0 (7.50 – 9.0) | 8.0 (8.0 – 9.0) | | |
| **6 months after intervention** | (n = 48[#]) | (n = 48[#]) | | |
| Min – Max. | 7.0 – 12.0 | 7.0 – 10.0 | | |
| Mean ± SD. | 8.38 ± 1.11 | 8.29 ± 0.79 | 1098.50 | 0.690 |
| Median (IQR) | 8.0 (7.50 – 9.0) | 8.0 (8.0 – 9.0) | | |
| **Fr ($p_0$)** | 36.963[*] (<0.001[*]) | 20.486[*] (<0.001[*]) | | |
| **$p_1$** | 0.006[*] | 0.139 | | |
| **$p_2$** | <0.001[*] | 0.041[*] | | |

| | | | | |
|---|---|---|---|---|
| **$p_3$** | 0.284 | 0.683 | | |

IQR: **Inter quartile range** SD: **Standard deviation** **U: Mann Whitney test**
Fr: Friedman test, Sig. bet. Periods were done using Post Hoc Test (Dunn's)
p: p value for comparing between the studied groups
$p_0$: p value for comparing between the studied periods in each group
$p_1$: p value for comparing between Pre and 3 months
$p_2$: p value for comparing between Pre and 6 months
$p_3$: p value for comparing between 3 months and 6 months
*: Statistically significant at $p \leq 0.05$
#: drop out case

**Discussion:**

Participants of our current study were matched regarding to the health status. Patients with diabetes complication were 24% and 34% in intervention and control group respectively. Presence of comorbidity was 66% and 54% respectively. We have 24 % and 20 % smokers in intervention and control groups. Our patients are dominantly receiving oral diabetic drugs (60 % in both intervention and control groups).

This study revealed that there is a highly significant improvement in depression scale in CBT group, while the control group did not significantly change, which is seen in the statistical significance difference in 3 and 6 months following the intervention ($p<0.001$). Improvement in depression scale started to be obvious in 3 months following intervention in comparison to pre-intervention assessment ($p= 0.002$) and lasts to 6months after the intervention ($p= 0.001$).

Similarly, one study conducted by Mansour et al (2022) in Cairo University found that both intervention and control groups were matched at baseline. Following the intervention, there was a significant reduction in depression symptoms in the CBT group, even after adjusting for pre-intervention levels on the BDI ($p = 0.01$). [4] According to this finding, patients with depression benefit from cognitive behavioural treatment. The fact that both investigations were conducted in the same nation, with the same environment and culture, may be the cause of these comparable findings.

In the current study, the glycaemic control (HbA1c score) in the CBT group improved significantly at 3 and 6 months after the treatment ($p=0.006$, $p<0.001$) in comparison with pre-intervention, and the control group also demonstrated improvement in glycaemic control at 6 months after the treatment compared to the pre- treatment assessment ($p=0.041$). no significant difference was detected among the two groups.

Mansour et al (2022) in their study found that HBA1c was improved significantly when controlling for pre-intervention HBA1c levels ($p = 0.042$) in comparison with the control group. [4] The similarity between this outcome and ours could be due to the fact that the patients in both groups had comparable levels of glycaemic control.

In the current study, both groups' adherence significantly improved three and 6 months after the treatment in comparison with baseline values ($p<0.001$). but, no statistical difference was observed among the two groups. This suggests that both CBT and routine diabetic education have a positive impact on medication adherence.

Similarly, Safren et al. (2021) discovered that in individuals with type 2 diabetes and depression, cognitive behaviour therapy (CBT) may be a useful intervention for glycaemic control, medication adherence, and depressive symptoms. This indicates that while CBT is a potential technique, further research may be necessary. [10]

In the current study, according to BMI, no significant difference was noted among the two groups before to and during the intervention, but there was a substantial change in the intervention group alone between the three and six-month measurements. This would suggest that it takes longer for CBT to have an impact on body weight.

According to Li et al. (2023), the intervention group experienced a greater but not statistically significant decline in BMI, systolic blood pressure, diastolic blood pressure, and HBA1c. [11] These findings suggest that a more robust intervention may be necessary to improve body mass index, or that the trial was conducted in a different socioeconomic context.

**Conclusion:**
The present study concluded that cognitive behavioural therapy for diabetic patients with mild to moderate depression significantly improved their depression scores when compared to standard diabetes and depression education. The glycaemic control in the CBT group improved significantly post treatment, the control group also demonstrated improvement in glycaemic control after usual diabetic education. However, no significant difference was noted in glycemic control among the two groups.

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