Effectiveness of Cognitive-Behavioral Stress Management Training with Regard to Glycemic Control, Psychological Distress, and Quality of Life in Patients with Type 2 Diabetes

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ABSTRACT

Objective: This study was designed to evaluate the effectiveness of cognitive-behavioral stress management training with regard to glycemic control, psychological distress (depression, anxiety, and stress) and quality of life in patients with type 2 diabetes.

Methods: A total of 60 patients with type 2 diabetes (34 females and 26 males; mean age 49.5±5.7 y) were included in this study. They were randomly divided into 2 groups. Members of one group attended 10 weekly sessions of cognitive-behavioral stress management training, while other group did not. Test of HbA1c (glycosylated hemoglobin), DASS (depression, anxiety and stress scale), and quality of life questionnaires were administered on both groups before and after the intervention. This assessment procedure was repeated within 3 months follow up.

Results: After intervention, HbA1c, psychological distress, and quality of life improved significantly ($P<0.01$) in trained patients, but there was no significant change in these measures in the control group. These results remained constant within 3 months follow up.

Conclusion: Results show that cognitive-behavioral stress management training is an effective intervention for improving glycemic control, psychological well-being, and quality of life in patients with type 2 diabetes.

1. Introduction

Diabetes mellitus is a major public health problem, which affects an increasing number of people around the world. Worldwide rise in the number of adults with diabetes has been estimated to be 122%, from 135 million in 1995 to 300 million in 2025 (King, Aubert, & Herman, 1998). Apparently, 14% to 23% of Iranian people who are more than 30 years old are under the effects of diabetes while the estimates of type 2 diabetes has reached up to 90%-95% of these cases (Larijani, Zahedi, & Aghakhani, 2003). This is a complex metabolic condition in which the patients have a life-long responsibility for managing their condition.

The first goal of diabetes management is the control of blood glucose levels, the so-called glycemic control, which is measured by an HbA1c blood test (Stratton et al., 2000). Just like other chronic diseases, patients suffering from type 2 diabetes may experience a variety of stress factors as a result of the illness and its treatment, including pain, disfigurement, impaired physical functioning, life-threat, permanent changes in lifestyle, dependency, self-management tasks, threats to dignity, diminished self-esteem, disruption of normal life transition, decreasing resources, and changes in future per-

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spectives (Bisschop, Kriegsman, Beekman, & Deeg, 2004). It has been observed that these disease-related stress factors may play an important role in the development of anxiety and depression among patients with chronic diseases (Zhang, Chen, & Chen, 2008). Diabetic patients compared to general population rate higher on depression and anxiety (Peyrot & Rubin, 1997; Anderson, Freedland, Clouse, & Lustman, 2001; Huang, Chiu, Lee, & Wang, 2011). Such symptoms were associated with poor glycemic control (Lustman et al., 2000), diabetic complications (Groot et al., 2001), and poor prognosis and quality of life (Tossani, Cassano, & Fava, 2005), which may lead to increased activity of sympathetic nervous system, elevated levels of cortisol and catecholamines, and finally raise the risk of metabolic syndrome (Rosmond, 2005; Lamounier-Zepter, Ehrhart-Bornstein, & Bornstein, 2006).

Importantly, those patients who experience significant psychological distress are more likely to have difficulties with diabetes self-care (Das-Munshi, Stewart, Ismail, & Bebbington, 2007) leading to worsening of glycemic control and development of serious complications (Groot et al., 2001), which easily turns to a vicious cycle (Peyrot et al., 2005). Moreover, the presence of clinical complications of type 2 diabetes tends to negatively influence the perception of quality of life (Lloyd, Sawyer, Hpkinson, 2001).

The United Kingdom Prospective Diabetes Study (UK Prospective Diabetes Study Group, 1998) has demonstrated that intensive blood glucose control is essential for reducing the risk of diabetic complications in type 2 diabetic patients. Essentially, no glycaemia thresholds have been observed for any type of diabetic complication: the lower the glycaemia, the lower the risk of complications (Stratton et al., 2000). Alam, Sturt, Lall, and Winkly (2009) suggested that patients with long-standing suboptimal glycemic control may benefit from psychological interventions. Also, many people with diabetes perceive that they need additional help and support with the psychosocial issues associated with diabetes (Davies, Dempster, & Malone, 2006).

Psychological interventions appear to be effective in improving psychological distress and glycemic control, however there is a shortage of psychological specialists in diabetes care systems and psychological treatments are difficult to access for most patients living with diabetes (Alam, Sturt, Lall, & Winkley, 2009). Peyrot and Rubin (2007) in their report suggested that, rather than waiting for a specific problem or deterioration of psychological status to be identified, psychological screening, assessment, and treatment should be routinely incorporated into patients' care. Among different psychological interventions, cognitive-behavioral ones have been used for improving psychological distress in type 1 (Snoek, Nicols, Ven, & Lubach, 1999; Amsberg et al., 2009) and type 2 diabetes (Welschen et al., 2007; Pourisharifi et al., 2010).

Considering shortage of psychological specialists and psychological treatments in diabetes care systems, group interventions based on approved approaches like cognitive-behavioral therapy can be helpful. This study aimed to assess the effectiveness of cognitive-behavioral stress management with regard to glycemic control, psychological distress, and quality of life in type 2 diabetic patients.

2. Methods

This was a cross-sectional comparative and Expos fac. This study was conducted on 60 patients with type 2 diabetes (34 females and 26 males; mean age 49.5±5.7 y) referred to Isfahan Charity Diabetes Center. The subjects were able to read and write in Persian and at least 6 months had passed since their diagnosis of diabetes. Those subjects, who abused drugs, needed hospitalization, insulin therapy, or psychiatric medication (because of diabetes complications), were excluded from the study. Finally, 53 patients were analyzed, and the rest dropped out due to different problems, including diabetes complications or not attending therapy or follow-up sessions.

Measures

Glycosylated hemoglobin (HbA1c):

Patients' physiologic glycemic control was measured using the glycosylated hemoglobin (HbA1c) blood test, which reflects glycemic control over the previous 2 to 3 months (American Diabetes Association, 1999).

Depression, anxiety and stress scale (DASS-42)

Patients' psychological distress was measured using the depression, anxiety and stress scale. This scale includes 42 items and 3 subscales (depression, anxiety, and stress). In Afzali, Delavar, Borjali, and Mirzamani's study (2007), the depression subscale showed a high correlation (0.849) with the Beck depression inventory (BDI) at 0.01 level of statistical significance. The stress subscale also found to have a high correlation coefficient (0.757) with subsurface scattering (SSS), again statistically significant at 0.01 level. The values of Cronbach α for the depression, anxiety, and stress subscales were

Table 1. Baseline variables measures.

Variables	Intervention	Control	Differences	t	P value
HbA1c	7.60 (0.88)	7.92 (1.05)	0.32	-1.17	0.320
Depression	20.34 (5.82)	21.55 (6.06)	1.19	-0.740	0.943
Anxiety	18.19 (5.85)	19.18 (5.39)	0.99	-0.642	0.807
Stress	18.80 (6.84)	20.29 (7.57)	2.11	-0.749	0.729
Quality of life	75.34 (6.65)	73.25 (8.41)	2.07	0.998	0.521

found to be 0.94, 0.85, and 0.87, respectively. The Kaiser-Meyer-Olkin (KMO) rate for the present study was 0.88, which indicates a large-enough sample size for factor analysis. The Cruet-Bartlett's test also showed a Chi-square rate of 0.794 with a degree of freedom equal to 861, which was again significant at 0.01 of α level.

Iranian brief form of WHO quality of life questionnaire (IRQOL)

IRQOL comprises 26 items and covers 4 domains of quality of life (physical health, psychological health, environment, and relationships). This questionnaire was translated by Nasiri (2006) to Persian. He reported 87% split-half reliability coefficient and reasonable concurrent validity with GHQ (general health questionnaire). Also this is a sensitive instrument to change in clinical settings.

The design of our research was a randomized clinical trial applied through pretest/posttest with a control group. Our intervention comprised 10 weekly 2-hour sessions of cognitive-behavioral stress management training, including the following topics: what is stress?, relation between stress and diabetes, coping styles, progressive relaxation, problem solving, time management, anger management, cognitive restructuring (2 sessions), and healthy life style (Fata, Bolhari, & kazemzade atufi, 2006). The pretest administered before the intervention and the posttest administered immediately 10 weeks after the last session of intervention. The follow-up assessment administered 3 months after the posttest.

Statistical analysis

Statistical analyses were performed using the SPSS 15.0. Results were analyzed through repeated measures ANCOVA.

3. Results

Participants' baseline scores are shown in Table 1, which demonstrates no significant differences between the two groups regarding HbA1c, depression, anxiety, stress, and quality of life.

The results of repeated measures ANCOVA indicated that our intervention effectively decreased HbA1c (P=0.007), depression (P<0.001), anxiety (P=0.001), and stress score (P<0.001) and increased quality of life score (P=0.011) in posttest and follow up compare to pretest corresponding values. Observed powers for all variables are reasonable (Table 2).

Results of tests of between subject effects (Table 3) showed that differences between two groups were sig-

Table 2. Tests of within-subject effects.

Variables	Type III sums of squares	df	F	P value	Partial eta squared	Observed power
HbA1c	2.217	2	5.14	0.007	0.09	0.815
Depression	132.982	2	10.213	<0.001	0.16	0.984
Anxiety	168.418	2	7.10	0.001	0.122	0.924
Stress	304.756	2	17.742	<0.001	0.258	1.00
Quality Of Life	170.161	2	4.735	0.011	0.085	0.780

Table 3. Tests of between-subject effects.

Variables	Type III sums of squares	df	F	P value	Partial eta squared	Observed power
HbA1c	16.314	1	8.510	0.005	0.143	0.816
Depression	572.238	1	6.87	0.012	0.119	0.730
Anxiety	563.678	1	7.34	0.009	0.126	0.758
Stress	1159.227	1	11.404	0.001	0.18	0.912
Quality Of Life	949.736	1	8.804	0.006	0.137	0.797

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nificant with regard to HbA1c (P=0.005), depression (P=0.012), anxiety (P=0.009), stress (P=0.001), and quality of life (P=0.006). Also, observed power for all variables were reasonable, especially for stress (Δ= 1.00), depression (Δ=0.984), and anxiety (Δ=0.924).

Finally results showed that our intervention effectively improved glycemic control, psychological well-being, and quality of life in patients with type 2 diabetes.

4. Discussion

Significant differences in HbA1c between the two groups were observed 10 weeks after intervention and maintained in 3 months follow up. Also significant differences were observed with regard to depression, anxiety, stress, and quality of life scores between two groups, after 10 weeks intervention and 3 months follow up.

Questions concerning the underlying mechanism(s) of improving glycemic control through this intervention and the routs in which glycemic control is linked with psychological distress were considered closely. Psychological interventions may affect diabetes controllers in 3 ways. The first step is to help the patients to accept their disease. Second step is to make them improve their self-care and self-efficacy behaviors, and the third step includes eliminating psychological distress which makes it much harder to control the disease (Poursharifi, 2010).

Supposedly, psychological distress may lead to increased sympathetic nervous system activity and elevate levels of cortisol and catecholamines, which can increase the risk of metabolic syndrome (Rosmond, 2005; Lamounier- Zepter, Ehrhart-Bornstein, & Bornstein, 2006). In other words, the link between symptoms of depression and anxiety and later onset of diabetes may lie in overactivity of the hypothalamic–pituitary–adrenal (HPA) axis resulting in elevated cortisol level that inhibits insulin function in a variety of ways (Ehlert, Gaab & Heinrichs, 2001).

It is not clear that which one of anxiety or depression is more related to glycemic control and diabetes. Shaban, Fosbury, Cavan, Kerr, and Skinner (2009) after controlling demographic and medical characteristics suggested that anxiety is the predictor of HbA1c not depression. Furthermore, the association between anxiety and HbA1c is mediated by diabetic specific psychological distress. Thus, the emotions and cognitions associated with diabetes may lead to maladaptive behaviors that result in suboptimal control.

On the other hand, depression is an important factor in metabolic control and diabetes. For example, Leonard, Egede, Anouk, Grubaugh, & Ellis (2010) suggest that individuals with diabetes and depression are less likely to engage in a wide range of preventive health practices that are not specific to diabetes disease management. Another study suggested that possible mechanisms include the influence of depressive symptoms on behavioral factors such as sedentary lifestyles, smoking, and overeating, resulting in metabolic disturbances, which may explain the onset of diabetes (Engum, 2007). Also altered activities in the HPA axis with cortisol elevations during depressive episodes (which affect approximately half of all patients) may increase the risk of type 2 diabetes. However, anxiety and depression as possible risk factors for diabetes could not be investigated separately, because of their common comorbidity (Brown et al., 2001).

Our findings showed that in addition to improving glycemic control and psychological well-being, cognitive-behavioral stress management improves quality of life in diabetic patients. Quality of life is a subjective concept encompassing a wide range of interrelated factors such as physical, functional, and psychological well-being, as well as religious and spiritual factors (Crrer et al., 2008) and patients with diabetes have a poorer quality of life

than normal people of the same age and gender (Estebany Pena et al., 2010). It is suggested that perception of quality of life is positively correlated to the severity of general psychopathology, but not with metabolic control, evaluated by HbA1c levels (Papelbaum et al., 2010). So the improvement in quality of life in our study may be the result of improvement in psychological distress (i.e. decrease in depression, anxiety, and stress).

In conclusion, cognitive-behavioral stress management training as a simple and relatively short intervention is effective for diabetic patients. This is not an expensive intervention with regard to its good effects on glycemic control, psychological well-being, and quality of life. So, we propose this intervention to be incorporated to the usual treatment programs of diabetes.

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Reference

Afzali, A., Dedavar, A., Borjali, A., & Mirzamani, M. (2007). [Psychometric properties of DASS-42 as assessed in a sample of Kermanshah high school students (Persian)]. *Journal of Research in Behavioral Sciences*, *5*(2), 81-92.

Alam, R., Sturt, J., Lall, R., & Winkley, K. (2009). An updated meta-analysis to assess the effectiveness of psychological interventions delivered by psychological specialists and generalist clinicians on glycemic control and on psychological status. *Journal of Patient Education and Counseling*, *75*(1), 25-36.

American Diabetes Association. (1999). Test of glycemia in diabetes. *Journal of Diabetes Care*, *22*, 77-9.

Amsberg, S., Anderbro, T., Wredling, R., Lisspers, J., Lins, P., Adamson, U., & et al. (2009). A cognitive behavior therapy-based intervention among poorly controlled adult type 1 diabetes patients—A randomized controlled trial. *Journal of Patient Education and Counseling*, *77*(1), 72-80.

Anderson, R. J., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2001). The prevalence of comorbid depression in adults with diabetes: A meta-analysis. *Journal of Diabetes Care*, *24*(6), 1069-1078.

Bisschop, M. I., Kriegsman, D. M. W., Beekman, A. T. F., & Deeg, D. J. H. (2004) . Chronic diseases and depression: The modifying role of psychosocial resources. *Journal of Social Sciences and Medicine*, *59*(4), 721-733.

Brown, T. A., Campbell, L. A., Lehmann, C. L., Grisham, J. R., & Mancill, R. B. (2001). Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology*, *110*(4), 585-99.

Crrer, C. J., Pontarolo, R., Melchiors, A. C., Rossignoli, P., Llimo, S. F. F., & Radominski, R. B. (2008). Traduc¸a˜o para o portugueˆs e validac¸a˜o do instrument. Diabetes Quality of Life Measure (DQOL Brasil). *Arquivos Brasileiros de Fndocrinologia & Metabologia*, *52*(3), 515-22.

Das-Munshi, J., Stewart, R., Ismail, K., Bebbington, P. E., & Prince, M. J. (2007). Diabetes, common mental disorders, and disability: Findings from the UK National Psychiatric Morbidity Survey. *Journal of Psychosomatic Medicine, 69*(6), 543-550.

Davies, M., Dempster, M., & Malone, A. (2006). Do people with diabetes who need to talk want to talk? *Journal of Diabetic Medicine*, *23*(8), 917-919.

Ehlert, U., Gaab, J., & Heinrichs, M. (2001). Psychoneuroendocrinological contributions to the etiology of depression, posttraumatic stress disorder, and stress-related bodily disorders: the role of the hypothalamus– pituitary–Adrenal axis. *Journal of Biological Psychology*, *57*(1-3), 141-52.

Engum, A. (2007). The role of depression and anxiety in onset of diabetes in a large population-based study. *Journal of Psychosomatic Research*, *62*(1), 31-38.

Esteban, Y., Pena, M. M., Hernandez Barrera, V., Fernández Cordero, X., Gil de Miguel, A., & Rodríguez Pérez, M., et al. (2010). Self-perception of health status, mental health and quality of life among adults with diabetes residing in a metropolitan area. *Journal of Diabetes & Metabolism*, *36*(4), 305-311.

Fata, L., Bolhari, J., & Kazemzadeh-Atufi, M. (2006). [*Stress management training for Ministry of Health and Medical Education workers* (Persian)]. Tehran: Tehran psychiatric institute, Mental Health Research Center.

Groot de, M., Anderson, R., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2001). Association of depression and diabetes complications: a meta-analysis. *Journal of Psychosomatic Medicine*, *63*(4), 619-630.

Huang, C. J., Chiu, H. C., Lee, M. H., & Wang, S. Y. (2011). Prevalence and incidence of anxiety disorders in diabetic patients: A national population-based cohort study, *Journal of General Hospital Psychiatry*, *33*(1), 8-15.

King, H., Aubert, R. E., & Herman, W. H. (1998). Global burden of diabetes, 1995–2025. Prevalence, numerical estimates, and projections. *Journal of Diabetes Care*, *21*(9), 1414-31.

Lamounier-Zepter, V., Ehrhart-Bornstein, M., & Bornstein, S. R. (2006). Metabolic syndrome and the endocrine stress system. *Journal of Hormone and Metabolic Research*, *38*(7), 437-441.

Larijani, B., Zahedi, F., & Aghakhani, S. (2003). Epidemiology of Diabetes Mellitus in Iran. *Shiraz E-Medical Journal*, *4*, 4.

Egede, L. E., Grubaugh, A. L., & Ellis, C. (2010). The effect of major depression on preventive care and quality of life among adults with diabetes. *Journal of General Hospital Psychiatry*, *32*(6), 563-569.

Lloyd, A., Sawyer, W., & Hpkinson, P. (2001). Impact of long–term complications on quality of life in patients with type2 diabetes not using insulin. *Journal of Value Health*, *4*(5), 392-400.

Lustman, P. J., Anderson, R. J., Freedland, K. E., Groot de, M., Carney, R. M., & Clouse, R. E. (2000). Depression and poor glycemic control: a meta-analytic review of the literature. *Journal of Diabetes Care*, *23*(7), 934-942.

Nasiri, H. (2006). *Stability and reliability of Iranian brief form of WHO Quality of Life Questioner*. Paper Presented in 3rd conference of students mental health at University of Science and Technology, Tehran, Iran.

Papelbaum, M., Lemos, H. M., Duchesne, M., Kupfer, R., Moreira, R. O., & Coutinho, W. F. (2010). The association between quality of life, depressive symptoms and glycemic control in a group of type 2 diabetes patients. *Journal of Diabetes Research and Clinical Practice*, 89(3), 227-230.

Peyrot, M., & Rubin, R. R. (1997). Levels and risks of depression and anxiety symptomatology among diabetic adults. *Journal of Diabetes Care*, *20*(4), 585-590.

Peyrot, M., Rubin, R. R, Lauritzen, T., Snoek, F. J., Matthews, D. R., & Skovlund, S. E. (2005). Psychosocial problems and barriers to improved diabetes management: results of the Cross-National Diabetes Attitudes, Wishes and Needs (DAWN) Study. *Journal of Diabetic Medicine*, *22*(10), 1379-1385.

Peyrot, M., & Rubin, R. R. (2007). Behavioral and psychosocial interventions in diabetes: A conceptual review. *Journal of Diabetes Care*, *30*(10), 2433-40.

Poursharifi, H., Babapour, J., Zamani, R., Besharat, M. A., Mehryar, A. M., & Rajab, A. (2010). The effectiveness of motivational interviewing in improving health outcomes in adults with type 2 diabetes. *Journal of Procedia Social and Behavioral Sciences*, *5*, 1580-1584.

Rosmond, R. (2005). Role of stress in the pathogenesis of the metabolic syndrome. *Journal of Psychoneuroendocrinology*, *30*(1), 1-10.

Shaban, C., Fosbury, J. A., Cavan, D. A., Kerr, D., & Skinner, T. C. (2009). The relationship between generic and diabetes specific psychological factors and glycaemic control in adults with type 1 diabetes. *Journal of Diabetes Research and Clinical Practice*, *85*(3), e26-e29.

Snoek, F. J., Nicols, C. W., Ven, V. D., & Lubach, C. (1999). Cognitive behavioral group training for poorly controlled type 1 diabetes Patients: A psychoeducational approach. *Journal of Diabetes Spectrum*, *12*(3), 147.

Stratton, I. M., Adler, A. I., Neil, H. A. W., Matthews, D. R., Manley, S. E., Cull, C. A., & et al. (2000). Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. *British Medical Journal*, *321*(7258), 405-12.

Tossani, E., Cassano, P., & Fava, M. (2005). Depression and renal disease. Seminars *in* Arthritis *and* Rheumatism, *18*(2), 73-81.

UK Prospective Diabetes Study Group. (1998). Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet*, *352*(9131), 837-53.

Welschen, L. M., Oppen, P., Dekker, J. M., Bouter, L. M., Stalman, W. A., & Nijpels, G. (2007). The effectiveness of adding cognitive behavioral therapy aimed at changing lifestyle to managed diabetes care for patient with type2 diabetes: Design of a randomized controlled trial. *BMC Public Health*, *7*, 74.

Zhang, C. X., Chen, Y. M., & Chen, W. Q. (2008). Association of psychosocial factors with anxiety and depressive symptoms in Chinese patients with type2 diabetes. *Journal of Diabetes Research and Clinical Practice*, *79*(3), 523-530.