

Association of cognitive-emotional regulation strategies to depressive symptoms in type 2 diabetes patients

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Aim. The present cross-sectional observational study aimed to investigate the relation between cognitive–emotional regulation strategies and depressive symptoms in type 2 diabetes patients in the context of sociodemographic and clinical factors, of diabetes distress, perception of illness consequences and previous depression.

Method. Multiple logistic regression was performed on the responses of 354 adults with type 2 diabetes (58.5% women; mean \pm SD age: 61.14 ± 8.5 years; diabetes duration: 9.7 ± 6.4 years; BMI: 30.9 ± 5.3 kg/m²). Depressive symptoms were present in 16.9% and diabetes distress in 45.5%. Participants completed questionnaires on depression (BDI-II), cognitive-emotional regulation strategies (CERQ), diabetes distress (DDS), illness perceived consequences (IPQ-R).

Results. Of the cognitive–emotional strategies, lower positive reappraisal of diabetes (OR:0.49; CI:0.34-0.70) and increased catastrophizing (OR:2.08; CI:1.47-2.91) were found to increase the likelihood of experiencing depressive symptoms in the presence of higher diabetes distress (OR: 1.53; CI:1.07-2.19), increased negative perception of diabetes consequences (OR:2.02; CI:1.34-3.06) and the presence of previous depression (OR:4.18; CI:2.03-8.63).

Conclusion. To our knowledge, this is the first study to report on cognitive-emotional regulation strategies in type 2 diabetes and provides evidence for the beneficial influence of positive reappraisal and adverse effect of catastrophizing on depressive symptoms in the context of diabetes distress, perceived consequences of diabetes and previous history of depression.

Key words: coping, depression, diabetes distress, illness perception.

INTRODUCTION

In diabetes mellitus, depression is common and has a negative impact on diabetes self-care, glycaemic control, diabetes complication and quality of life [1-4]. Coping plays an important role in the relation between negative life events, such as diabetes, and depression [5]. Classical coping theory distinguishes between two major coping strategies: problem-focused strategies (modify the stressor with the help of behaviours) and emotion-focused strategies (regulate the emotions that emerge when we confront the stressor) [6-8]. A shortcoming of this distinction is that both coping dimensions consist of joint cognitive and behavioural strategies without a clear distinction of the cognitive mechanisms [9]. Cognitive emotional regulation coping relates to the conscious way of regulating emotions through the use of cognitions which helps us manage our feelings and prevents us from getting overwhelmed [10]. Impairment in the use of cognitive-emotional regulation is considered the core part of depression and it was shown to be common in people with a chronic health condition [11, 12].

In the literature nine different cognitive-emotional regulation coping strategies have been described: self-blame, other-blame, rumination, positive refocusing, positive reappraisal, acceptance, catastrophizing, new perspective and planning [13]. The habitual use of certain strategies was found to be associated to negative emotional outcome [14]. For example, Garnefski found that less adaptive strategies such as self-blame, catastrophizing and rumination were associated to depression opposed to more adaptive strategies such as planning and positive reappraisal which had a protective role [15]. In women with ovary and uterus cancer, higher catastrophizing, lower planning and lower acceptance, decrease positive reappraisal and positive perspective were associated to depression and in type 1 adolescents, positive refocusing and not positive reappraisal, perspective or planning was beneficial against depression [16, 17].

In type 2 diabetes, little is known about cognitive–emotional regulation strategies, especially of those associated to depression. Since individuals' cognitions are associated to behaviours, type 2 diabetes patients might have a distinct cognitive

style that can be beneficial to a better adjustment to the illness and may prevent depression. The characteristics of cognitive style in these patients is unclear and, to our knowledge, no study has investigated it in relation with depression. When investigating depression in type 2 diabetes, the environmental context should be considered. Lower age, female sex, lower education level, higher body mass index (BMI), diabetes comorbidities and complication, duration of diabetes and its treatment were previously found to be associated to depression [18-22]. History of previous depression and diabetes distress have a cyclic relation to depression with both condition being associated one to the other [23]. Negative perception of diabetes consequences was found to predict both depression and diabetes distress [24, 25].

Therefore, the purpose of the present study was to identify the cognitive – emotional regulation strategies that are related to depressive symptoms in people with type 2 diabetes in the context of sociodemographic, clinical and psychological factors such as diabetes distress, perception of illness consequences and previous depression. We hypothesize that rumination, catastrophizing and self-blame will be associated with increased symptoms of depression and positive refocusing and reappraisal will be associated with less depressive symptoms.

MATERIAL AND METHOD

PARTICIPANTS

A total number of 354 consecutive outpatients visiting the Center for Diabetes, Nutrition and Metabolic Diseases Cluj, Romania between December 2014 and January 2015 that fulfilled the selection criteria were enrolled. Type 2 diabetes patients, with no cognitive impairments and no known psychiatric conditions, were included. At the regular appointment with the diabetologist, the participants were informed on the aim of the study and written consent was obtained. The Ethic Committee of the Hospital approved the study protocol prior to enrollment of participants.

MEASUREMENTS

Age, sex, education and previous diagnosed depression were self-reported. Duration of diabetes, present diabetes treatment, diabetes-related number of complications and comorbidities, BMI (kg/m^2), glycated hemoglobin (HbA1c mmol/mol) were collected from the medical files, with informed consent.

Diabetes perceived consequences were assessed using the consequences subscale of Illness Perception Questionnaire – Revised (Cronbach's alpha = 0.68 for the present sample) [26]. The consequences sub-scale of IPQ contains items that refer to diabetes financial costs, partners or family difficulties due to diabetes. The sub-scale is scored on a five-point Likert scale starting from strongly disagree = 1 to strongly agree = 5. Higher score represented higher negative perception of diabetes consequences.

To assess diabetes distress, the Romanian version (DDS-Ro) of Diabetes Distress Scale (DDS) was used [27, 28]. It assesses distress regarding health care team, diabetes management, emotional impact, family and friends' social support. DDS-Ro internal consistency for the entire scale in the present sample was 0.827. Higher score represents higher diabetes distress (little or no distress, score < 2.0; moderate to higher distress score ≥ 2.0) and was used to better characterize the sample [29]. For the rest of the analysis, the continuous form of the DDS-Ro was used.

The Romanian version of the Beck Depression Inventory II (BDI-II) was used to assess depressive symptoms [30, 31]. The questionnaire consists of 21 items rated on an intensity scale from 0 (low intensity) to 3 (highest intensity) with a maximum score of 63. Higher score represents more intensive depressive symptoms. Internal consistency for the present sample was Cronbach's alpha = 0.90. The presence of depressive symptoms was defined as BDI-II ≥ 14 [32, 33].

Cognitive Emotional-Regulation Questionnaire (CERQ) is a self-reported questionnaire assessing cognitive coping mechanism [34]. It has 36 items that measure 9 independently coping strategies. Each item is rated on four-point Likert scale which ranges from 1 (never) to 5 (always). The sub-scales of CERQ are: self-blame (Cronbach's alpha = 0.72); acceptance (Cronbach's alpha = 0.64); ruminations (Cronbach's alpha = 0.78); positive refocusing (Cronbach's alpha = 0.84); refocus on planning (Cronbach's alpha = 0.77); positive reappraisal (Cronbach's alpha = 0.77); new perspective (Cronbach's alpha = 0.49); catastrophizing (Cronbach's alpha = 0.69); other blame (Cronbach's alpha = 0.62). Due to the weak reliability, a new perspective dimension was not introduced into the analysis.

STATISTICAL ANALYSIS

To characterize the sample, descriptive statistics were used. For comparison between depressed and non-depressed group, independent T-test, Chi-squared and Mann-Whitney U-test were used. To

better understand the context of diabetes and in order to have a better overview of the interaction between investigated factors and depression, multiple logistic regression was used with the aim to analyse the association of the following category of factors: socio-demographic (age, sex, and education level), clinical and biological (years since diagnosis, type of treatment, diabetes-related number of complications and comorbidities, BMI, HbA1c), psychological (diabetes distress, perception of illness consequences, previous history of depression) and cognitive coping strategies in relationship to depressive symptoms. A significance level of $p < 0.05$ was chosen.

RESULTS

The total sample included 354 adults with type 2 diabetes aged between 20 to 74 years old, with cardiovascular disease as the most frequent

comorbidity (48.3%). Of total, 161 (45.5%) presented diabetes distress and 60 (16.9%) presented depressive symptoms. The depressed group differed from the non-depressed group in respect to sociodemographic, clinical and psychological factors as well as cognitive coping strategies. Table 1 shows the sample general characteristics and differences by group.

The effects of the sociodemographic, clinical and biological, psychological and coping factors were examined by multiple regression models (Table 2). The final model, including all statistically significant factors from previous models, explained 43% in the variance of depressive symptoms and correctly classified 87.3% cases. Lower positive reappraisal and increased catastrophizing were associated with increased likelihood of experiencing depressive symptoms in the context of negative perception of illness consequences, diabetes distress and previous depression.

Table 1
General characteristics and group differences between depressed and non-depressed

Variables	N = 354	Depressive Symptoms		p-value*
		with N = 60	without N = 294	
Sex (%)				
Female	207 (58.5%)	41 (68.33%)	166 (56.46%)	0.08
Age	61.14(8.5)	61.83(9.18)	61.00 (8.92)	0.38
Education (%)				0.01
Elementary	22 (6.2%)	7 (11.66%)	15 (5.2%)	
Secondary	70 (19.8%)	18 (30%)	52 (17.68%)	
High School	189 (53.4%)	27 (45%)	162 (55.1%)	
University	73(20.6%)	8 (13.33%)	65 (22.1%)	
BMI (kg/m ²)	30.9 (5.3)	31.06 (6.09)	30.1 (5.27)	0.72
Diabetes duration, years	9.7 (6.4)	9.78 (6.78)	9.69 (6.38)	0.90
Treatment (%)				0.68
Medication	212(59.8%)	35(58.33%)	177 (60.2%)	
Insulin+Medication	52 (14.7%)	7 (11.66%)	45 (15.3%)	
Insulin only	90 (25.4%)	18 (30%)	72 (24.48%)	
Number of diabetes complications	0.2(0.5)	0.33 (0.60)	0.19 (0.50)	0.02
Number of comorbidities	1.1 (0.9)	1.37 (0.95)	1.06 (0.94)	0.01
HbA1c, mmol/mol	59.9 (19.9)	58.28 (20.68)	60.30 (19.79)	0.49
IPQ consequences	17.05 (5.19)	20.75 (4.86)	16.29 (4.94)	0.001
DDS-Ro	1.9 (0.7)	2.5 (0.84)	1.8 (0.65)	0.001
Previous depressive, (%)	79 (22.3%)	30 (50%)	49 (16.66%)	0.006
Coping strategies				
Self-blame	9.89 (4.21)	10.52 (4.27)	9.72 (4.19)	0.16
Acceptance	14.27 (3.47)	14.36 (3.45)	14.25 (3.48)	0.80
Rumination	11.33 (4.65)	12.71 (4.24)	11.05 (4.69)	0.01
Planning	13.86 (4.31)	13.02 (4.34)	14.03 (4.29)	0.13
Refocusing	14.12 (4.50)	12.03 (4.84)	14.54 (4.32)	0.01
Positive reappraisal	13.60 (4.54)	11.74 (4.52)	13.97 (4.47)	0.01
Catastrophizing	7.48 (3.73)	10.54 (4.26)	6.87 (3.29)	0.01
Other-blame	6.76 (4.26)	8.64 (7.02)	6.38 (3.36)	0.01

Note. Values represent mean and standard deviation (SD), unless otherwise specified; BMI – body mass index; HbA1c – glycated hemoglobin; IPQ –Illness Perception Questionnaire; DDS-Ro – Diabetes Distress Scale Romanian

* p-value < .05

Table 2
Five model factors associate to depressive symptoms (Logistic Regression)

Variables OR (95%CI)	Model 1 Sociodemographic	Model 2 Clinical	Model 3 Psychological	Model 4 Coping	Model 5 Final
Age, years	1.01 (0.97-1.04)	-	-	-	-
Sex	1.39 (0.75-2.56)	-	-	-	-
Education level	0.62 (0.44-.89)*	0.45 (0.28-0.73)*	0.64 (0.42-0.96)*	0.74 (0.47-1.15)	-
Time since diagnosis, years	-	1.01 (0.93-1.19)	-	-	-
Treatment	-	1.13(0.75-2.29)	-	-	-
Diabetes complications (n)	-	0.89 (0.38-2.04)	-	-	-
Comorbidities (n)	-	1.65 (1.07-2.56)*	1.12 (0.78-1.59)	-	-
BMI, kg/m ²	-	1.03 (0.96-1.11)	-	-	-
HbA1c, mmol/mol	-	0.99 (0.96-1.01)	-	-	-
IPC consequences	-	-	1.78 (1.22-2.6)**	1.92(1.24-2.95)**	2.02 (1.34-3.06)**
DDS	-	-	1.94 (1.39-2.69)**	1.56 (1.06-2.31)*	1.53 (1.07-2.19)*
Previous depression	-	-	4.36 (2.16-8.77)**	3.91(1.84-8.31)**	4.18 (2.03-8.63)**
CERQ self-blame	-	-	-	1.35 (8.55-2.14)	-
CERQ Acceptance	-	-	-	8.36 (0.54-1.27)	-
CERQ Rumination	-	-	-	1.09 (0.60-1.97)	-
CERQ Positive Refocusing	---	-	-	0.76 (0.49-1.16)	-
CERQ Planning	-	-	-	0.95 (0.51-1.63)	-
CERQ Reappraisal	-	-	-	0.53 (0.31-0.98)*	0.49 (0.34-0.71)**
CERQ-Catastrophizing	-	-	-	1.88(1.22-2.88)**	2.08(1.47-2.93)**
CERQ Other Blame	-	-	-	0.44 (0.80-1.64)	-

Note. OR = odd ratio; CI = 95% confidence interval; IPQ –Illness Perception Questionnaire; DDS-Ro = Diabetes Distress Scale; CERQ – Cognitive-Emotional Regulation Questionnaire

* p-value < .05; **p-value < .01.

DISCUSSION

To our knowledge, this is the first study to report on cognitive emotional regulation strategies and their association to the presence of depressive symptoms in patients with type 2 diabetes. The present study shows that higher catastrophizing and lower positive reappraisal are associated to higher depressive symptoms in the context of negative perception of illness consequences, diabetes distress and history of previous depression.

When compared with non-depressed group, people in depressed group were characterized by being mostly women with lower level of education and increased number of diabetes complications and comorbidities, with the higher perceived of negative consequences of diabetes and diabetes distress, higher rumination and catastrophizing and lower planning, positive reappraisal and refocusing. Although these differences between the two groups, only previous depression, increased diabetes distress and negative consequences of the illness were related to depressive symptoms in the final model of the analysis. Of the cognitive coping strategies included in our hypothesis, only catastrophizing and lower positive reappraisal remained associated to depressive symptoms. Our findings are supported by those found in the literature. Garnefski found similar results in a study of five different samples: early adolescents (age 12-15 years old), late adoles-

cents (age 16-18 years old), adults general population (age 18-65 years old), elderly (age ≥ 65 years old) and psychiatric adults (age 18-65 years old) [35]. Higher catastrophizing, increased rumination and lower positive reappraisal were related to depression in all five samples. In a study of type 1 diabetes adolescents, high level of self-blame in girls, increased catastrophizing and rumination, decreased positive reappraisal and planning in both girls and boys were related to increased level of depression [36]. Different from our study, in the previous mentioned studies, more cognitive coping strategies were endorsed by the participants. A possible explanation could be that our study included only type 2 diabetes adults, aged 20-74 years old, both men and women with a chronic disease that has an impact on daily activities due to its invasive management. Another important difference from the other studies is that the coping strategies were analyzed in the context of psychological, clinical and sociodemographic aspects of diabetes, context that can influence the way people relate to diabetes. These findings from the present study suggest that catastrophizing and positive reappraisal are not affected by the relationship between depressive symptoms and negative perception of diabetes consequences, diabetes distress or previous history of depression. Diabetes is a complex metabolic disease which requires daily management. In diabetes, catastrophizing refers to the exaggerated threat felt

by people that stresses the terror of living with the illness and the need to manage it. Catastrophizing diabetes and its daily demands found in our study is in line with 'diabetes burden theory' which states that the diagnosis of diabetes and all the illness demands can be overwhelming [37]. Perception of diabetes develops in the first months after diagnosis and re-evaluation in a positive way of diabetes and its management can have a protective role in respect to depression by developing a positive cognitive-emotional style that has beneficial effects on health and quality of life [38, 39]. Positive reappraisal refers to giving a personal meaning to a negative event, such as enhanced wisdom or personal growth [40]. Positive reappraisal of an event does not involve denying the negative consequences of the event, but accepting them and finding a positive meaning for experiencing them. In our study, positive reappraisal was found to have a beneficial role against depression, meaning that people with diabetes can benefit from reframing diabetes in terms of personal growth. It was shown that adults with chronic illness (59-76 years) are more likely to positive reappraise and reorganise important things in their life in order to live a meaningful life without the restriction caused by their illness [41, 42]. This interpretation of the illness can be more helpful for type 2 diabetes patients where the diagnosis of illness comes in adult life. For example, for women with breast cancer, positive reappraisal was found to be the only coping strategy associated to physical adjustment to the illness [43]. For these women, positive reappraisal was found to be associated with high perceived control of the illness and religious beliefs in divine control [44, 45]. In our study, of the cognitive strategies, the strongest association with depressive symptoms was found in catastrophizing diabetes whereas positive reappraisal of diabetes had a weak association with depressive symptoms. Type D personality and impairment in executive function can be an explanation for our findings. People with Type D personality avoid expressing their cognitions and emotions in social interaction due to the fear of social rejections or disapproval and, as a consequence, they tend to experience stable negative emotions [46, 47]. On the other hand, depression was found to be linked to deficits of attention, inhibition and memory suggesting a predisposition for negative mood due to cognitive inflexibility [48]. These might explain why, in people with diabetes, repeated, unintentional negative cognitions of catastrophizing are present at such an intensity and why these people have difficulties in making positive reappraisals and changing their emotional state. In diabetes, cognitions,

emotions and psychiatric symptoms such as depression were shown to improve with the help of cognitive-behavioral therapy [49].

In our study, diabetes perceived consequences, diabetes distress and previous depression were also related to depressive symptoms. It is debatable if diabetes distress and perceived consequences precede the coping mechanisms, contributing to depression or if the coping mechanism precedes illness consequences and diabetes distress. Also, due to the presence of depressive symptoms, diabetes can be seen in a catastrophic way, being a precipitating factor for negative perception and diabetes distress. Moreover, the relationship between diabetes distress and depression on the one hand, and the one between diabetes and depression, on the other hand, are bidirectional [50]. It is possible that all these hypotheses are true at the same time and as a consequence, the relation between coping strategies, illness perception and emotional distress can be seen as multidirectional.

A few shortcomings should be noted. First, BDI-II is only a screening questionnaire and could identify only the depressive symptoms and not a diagnosis of depression. In further studies, beside questionnaire, standardised interviews should be used. Second, previous depression was self-reported without the possibility of differentiating between different categories of depression. Further studies could include categories of depression such as dystimia or recurrent episodes of depression. Also, for a better understanding of the relationship between the variables included in this study, a longitudinal approach that will take into account sex and age differences is needed.

CONCLUSION

Overall, these findings suggest that catastrophizing coping strategy acts as a predictor for the presence of depressive symptoms, while a positive reappraisal of a life with diabetes might have a beneficial influence. Using efficient coping strategies can be part of intervention for individuals diagnosed with diabetes and interventions targeting efficient coping strategies could be included in counselling and education trainings for people with diabetes from the moment of diagnosis.

Declaration of interest. Authors declare that they have no conflict of interest. All authors have actively participated in the conception and design of the study, acquisition, analysis and interpretation of data. This study was not funded/sponsored.

Obiectiv. Acesta este un studiu observațional transversal care investighează relația dintre strategiile de autoreglare cognitiv-emoțională și prezența simptomatologiei depresive la pacienții cu diabet tip 2 în contextul factorilor socio-demografici, clinici și ai distresului legat de diabet, percepția consecințelor bolii și prezența tulburării depresive anterioare.

Metodă. Prin regresie logistică multiplă au fost analizate răspunsurile a 354 adulți cu diabet tip 2 (femei 58.5%; medie \pm AS vârstă: 61.14 ± 8.5 ani; durată diabet: 9.7 ± 6.4 ani; IMC: 30.9 ± 5.4 kg). Simptomatologia depresivă a fost prezentă în 16.9% iar distresul legat de diabet în 45.5%. Participanții au completat chestionare referitoare la depresie (BDI-II), autoreglarea cognitiv-emoțională (CERQ), distres în diabet (DDS) și percepția consecințelor bolii (IPQ-R).

Rezultate. Reevaluare negativă a diabetului (OR:0.49; CI:0.34-0.70), catastrofare crescută (OR: 2.08; CI: 1.47-2.91), distres legat de diabet crescut (OR: 1.53; CI: 1.07-2.19), percepție negativă a consecințelor bolii crescută (OR: 2.02; CI:1.34-3.06) și prezența antecedentelor depresive (OR: 4.18; CI:2.03-8.63) au fost asociate cu prezența simptomatologiei depresive curente.

Concluzii. Acesta este primul studiu care investighează strategiile de autoreglare cognitiv-emoțională la pacienții cu diabet tip 2 evidențiind relația dintre reevaluarea bolii, catastrofarea bolii și simptomatologia depresivă în contextul percepției consecințelor bolii, distresului legat de diabet și antecedentelor depresive.

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