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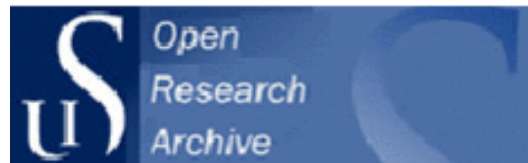
The relationship between diabetes-related distress and clinical variables and perceived support among adults with type 2 diabetes: A prospective study

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ABSTRACT

Background: Diabetes-related distress is a prevalent emotional state experienced among people living with type 2 diabetes. It has predominantly been studied in relation to diabetes management and metabolic control and to some extent in relation to perceived social support. Little is known about the relative prospective contribution of clinical variables and perceived support on diabetes-related distress.

Objective: To investigate the predictive influence of clinical variables and perceived support from health care professionals and family on diabetes-related distress. Design: The study has a prospective, longitudinal design. Settings: The participants were recruited from seven general practitioners in the south western part of Norway and from members of the Norwegian Diabetes Association. Participants: The sample comprised 296 people with type 2 diabetes. Inclusion criteria were: adults (30–70 years) diagnosed with type 2 diabetes who were willing and able to complete a questionnaire written in Norwegian.

Methods: Data were collected by postal questionnaires assessing perceived support from health care professionals and family and diabetes-related distress measured by the Problem Areas in Diabetes Scale at two time points separated by an interval of one year (October 2008 and 2009). Clinical data were collected by self-report. The follow-up group, for which both assessment data were available, constituted our sample comprising 296 adults.

Results: Descriptive results and findings from correlations and prospective multivariate associations indicate small changes in diabetes-related distress over a period of one year. In total, multiple regression analyses showed that clinical variables were very weak predictors of diabetes-related distress, whereas perceived social support emerged as statistically significant although a moderate predictor of distress. Among the support variables, only 'constructive support from health care professionals' and 'non-supportive family behaviour' accounted for changes in diabetes-related distress.

Conclusions: Findings suggest that diabetes-related distress among adults with type 2 diabetes is relatively stable over time and may be difficult to alter. Health care professionals should therefore be aware that stimulating people to change is challenging and complex. Moreover, they should devote more attention to non-clinical factors such as social support when addressing diabetes-related distress.

What is already known about the topic?

- Type 2 diabetes involves a complex and life-long process requiring a large degree of self-management with the goal of achieving adequate metabolic control and preventing long-term complications.
- Diabetes-related distress is a prevalent emotional state found among people living with type 2 diabetes.
- Diabetes-related distress has mainly been studied in relation to diabetes-management and metabolic control and only, to some extent, in relation to perceived social support.

What this paper adds?

- Scores for diabetes-related distress were found to be relative stable over a period of one year, possibly reflecting that adults with type 2 diabetes have developed rather habitual and stable ways of dealing with stress.
- Change in diabetes-related distress was only to a fairly small degree predicted by clinical variables, whereas social support appeared to be a statistical significant although moderate predictor.
- Health care professionals should pay more attention to non-clinical factors such as social support when addressing diabetes-related distress.
- Health care professionals should be attentive to the fact that assisting people to manage diabetes-related challenges and change lifestyles is complex and may require tailor-made, on-going support.

1. Introduction

Diabetes-related distress is a prevalent emotional state found among people living with type 2 diabetes (Fisher et al., 2009; Polonsky et al., 2005). Type 2 diabetes involves a complex and life-long process requiring a large degree of self-management on the part of the individual with the goal of achieving adequate metabolic control and preventing long-term complications. Many people with type 2 diabetes may therefore become emotionally overwhelmed, frustrated and discouraged by the challenges of this multifaceted and often demanding set of self-care activities as well as by the threat of developing long-term complications (Fisher et al., 2009; Polonsky et al., 2005). In the present study, diabetes-related distress will be understood as this kind of emotional reaction when dealing with the demands of the disease. Earlier studies have suggested that diabetes-related distress is closely linked to a reduction in well-being and to mental health problems such as symptoms of anxiety and depression among people with type 2 diabetes (Fisher et al., 2010; Papelbaum et al., 2010). According to de Groot et al. (2010), such problems are more prevalent among people with type 2 diabetes than in those of the general population. Moreover, diabetes-related distress has mainly been studied in relation to diabetes-management and metabolic control and, to some extent, in relation to perceived social support (Lloyd et al., 2005; Polonsky et al., 1995; Snoek et al., 2000a; Welch et al., 1997).

Given the importance of diabetes-related distress and its associations with mental health problems and diabetes outcomes, studies using prospective design with the possibility of making stronger statements about the causal role should be of special interest. Such a design may contribute to a better understanding of factors predicting diabetes-related distress. This study is therefore a follow-up of a previous cross-sectional study (Karlsen et al., 2012), utilizing a prospective design where we sought to understand to what extent central clinical variables of diabetes regulation such as glycosylated hemoglobin (HbA1c), diabetes treatment, diabetes-related complications, disease duration, body mass index (BMI) and perceptions of social support predict perceived disease-related distress among people with type 2 diabetes.

1.1. Background

In Norway, the general practitioners have traditionally been responsible for the primary care of type 2 diabetes. Many of these are working in teams with medical secretaries. Most of the medical secretaries are registered nurses and trained in diabetes care (Jenum et al., 2008). The treatment is primarily based on stimulating self- management. Routinely, diabetes care and follow-up are recommended in clinical guidelines (Claudi et al., 2009) and include information, counseling, collaboration and different kind of interventions in order to support people with type 2 diabetes to integrate the demanding self-care activities into their daily life. In addition, many people with type 2 diabetes are offered a structured educational program at the hospital, which includes information and counseling about the disease. Most people with type 2 diabetes have regular consultations at least every sixth months with their designated general practitioners. A tighter monitoring and assistance to those with more serious complications are also standard procedures.

Type 2 diabetes requires long-term adherence to a complex diet, physical activity, medication and blood glucose monitoring to obtain optimal glucose control and prevent long-term complications. As obesity is one of the common causes of this form of diabetes, it may also be necessary for many people to reduce weight in order to regulate their disease. Thus, glycosylated hemoglobin (HbA1c), diabetes treatment, diabetes-related complications, disease duration and body mass index (BMI) were selected as five important clinical variables to reflect regulation of type 2 diabetes, since they may deteriorate the management of the disease and thus have a negative influence on individuals' psychological well-being. First, glycaemic control has been found to be a modest but significant factor related to

diabetes-related distress (Fisher et al., 2010; Polonsky et al., 1995; Welch et al., 1997). This relationship could be due to diabetes-related stress leading to poor self-regulation. On the other hand, it is also possible that indications of poor glycaemic control could instigate distress in the diabetic individual. Second, it is demonstrated that individuals treated with insulin report higher diabetes-related distress compared with oral- or diet-treated patients (Delahanty et al., 2007). More intensive treatment could thus signal to the person with type 2 diabetes that their condition is deteriorating. Third, many people with type 2 diabetes experience high levels of emotional distress stemming from the experience of having more complications (Fisher et al., 2001, 2010; Yang et al., 2009). Moreover, long diabetic duration is regarded as a determinant factor of depression in people with type 2 diabetes (Yang et al., 2009). On the other hand, such relationships have also been found to be absent (Fisher et al., 2001). Finally, it could be suggested that worries about increased BMI may be a source of higher levels of distress. Subsequently, all of these significant variables of diabetes regulation may be factors predicting diabetes-related distress and are therefore included in the present study.

The social environment may provide vital resources, which the individual can and must draw upon to survive and flourish (Lazarus and Folkman, 1984). There is a rich literature demonstrating positive associations of social support on health-related well-being (Kosciulek, 2007). According to Cohen and Wills (1985), constructive support may exert the effect on well-being directly (i.e. irrespective of the presence of stress). In the context of this paper, social support refers to the nature of interactions occurring in social relationships and how the person evaluates these interactions in terms of their supportiveness (Lazarus and Folkman, 1984). A growing body of literature has documented positive relationships between social support and diabetes-related health (Tang et al., 2008). Since type 2 diabetes involves complex daily efforts, it is suggested that people with diabetes need to be supported to maintain and sustain self-management activities in order to live well with the disease. Support from the social environment may thus be an essential contributor to successful adjustment for people with type 2 diabetes (Schreurs and de Ridder, 1997).

Social support as a concept often states four broad attributes of behavior that may be expressed in different forms such as emotional support, affirmation support, informational support and tangible support (Stewart, 2000; Taylor, 2006). These attributes may facilitate people's chances of succeeding and thus eliminate negative consequences of stress. Emotional support involves the provision of empathy, caring, love and trust. Such support may strengthen feelings of self-worth and affirming as well as of coping efforts among people with type 2 diabetes. Affirmation support is closely linked to emotional support and validates and appraises the person as a valuable individual. Informational support includes the provision of information, suggestions and advice, for instance about a healthful diet, regular physical activity, use of medicine and blood glucose self-monitoring. This kind of support may help an individual to profit from the suggestions about the best way to deal with the challenges of living with type 2 diabetes. Finally, tangible support involves the provision of practical assistance. Such support may be essential for people with type 2 diabetes in order to perform specific diabetes-related behaviors. Moreover, the individual's perception of support can be either positive (constructive) or negative (non-constructive).

The health care service is one support system that could influence the well-being of people with type 2 diabetes, because type 2 diabetes is a lifelong chronic disease involving frequent consultations with health care providers for on-going education and support. According to Thorne and Paterson (2001), professional support can be a powerful factor influencing the way the individual adapts to the disease. On the other hand, health care professionals who did not believe the individual with diabetes to be capable of managing their own disease often caused them to be confused or discouraged with their self-management (Thorne and Paterson, 2001). This suggests that relation- ships with health care providers are not necessarily supportive and may become a stressor themselves.

The family may be another support system that could influence the well-being of people with type 2 diabetes. Family members are required to provide assistance with the day-to-day management of diabetes as well as encouragement and support in decision making (Ford et al., 1998). Support from family members has been considered to be vital for adults with type 2 diabetes, because it enhances the patient's physical and emotional functioning (Taylor, 2006). On the other hand, family support is not necessarily constructive. Non-constructive family behavior such as nagging and criticism can reduce people's perceptions of autonomy. This could, in turn, result in less motivation to cope with the problems induced by the disease and emotional distress (Deci et al., 1991). However, little attention has been devoted to study to what degree family support predicts diabetes-related distress. Most research has assumed that social support is only constructive. Conversely, it is not uncommon to observe non-supportive behavior or lack of non-supportive behavior from health care professionals and family members (Karlsen et al., 2004). It is therefore important to focus on both types of behaviors from health care professionals and family members and their predictive influence on diabetes-related distress. The present study therefore distinguishes between behaviors that are perceived to be supportive or non-supportive.

Social support as a concept originates from psychology in the 1970s (Cobb, 1976) and is primarily individually rooted. A more collective oriented concept is social capital which emerges from sociology (Coleman, 1988) and has migrated into the field of health sciences. In this field, social capital focuses amongst other on health benefits from the interaction within and support gained from the principal network of the patient as demonstrated by Kunitz (2004). Also support from 'voluntary associations' such as health care organizations is deemed social capital, but at the instrumental level (Kunitz, 2004). Thus social support which includes actions of different valence from health- care providers and family may be seen as a subset of social capital.

In summary, although there is some research on diabetes-related distress related to self-care, metabolic control and perceived social support, only one study is found to focus on the relative contribution of clinical variables and perceptions of social support to perceived distress among people with type 2 diabetes. This previous Norwegian cross-sectional study reported that diabetes-related distress was only associated with clinical variables to a small degree, whereas perceived support seemed to have a greater influence. To investigate to what extent the included clinical variables and perceived social support could be antecedents of diabetes-related distress among people with type 2 diabetes, we conducted a study using a prospective longitudinal design.

The main aim of the study was to investigate the predictive influence of different clinical variables such as disease duration, diabetes treatment, BMI, HbA1c, diabetes-related complications and perceived support from health care professionals and family members on diabetes- related distress in a sample of adults with type 2 diabetes. The specific hypotheses were addressed as follows: (1) negative scores on clinical variables assessed at the first assessment (T_1) predict an increase in diabetes-related distress at the second assessment (T_2), (2) constructive support from healthcare professionals and family at T_1 antecedes lower diabetes-related distress at T_2, and (3) non-constructive support from healthcare professionals and family members at T_1 predicts higher diabetes-related distress at T_2.

2. Methods

2.1. Design

This is a follow-up study, and it has a prospective longitudinal design. The data were collected at two time points, in October of both 2008 and 2009, by means of postal questionnaires.

2.2. Sample and setting

The sample included 296 adults with type 2 diabetes (n = 296), recruited by nominators who determined if subjects met the inclusion criteria for the study. The nominators included seven general practitioners in the south western part of Norway and staff members of the Norwegian Diabetes Association. The Norwegian Diabetes Association recruited subjects from five Norwegian coun- ties, strategically selected to represent cultural variations between Norwegian regions and settlement patterns (urban vs. rural). Inclusion criteria included subjects aged between 30 and 70, diagnosed with type 2 diabetes, who were willing to and able to complete a questionnaire written in Norwegian. The age limit of 30–70 was selected because it is representative of the vast majority of people living with type 2 diabetes in Norway (Stene et al., 2004). Data were collected at two time points. The second assessment (T_2) occurred one year after the first one (T_1) in the same fall month of each year. In T_1, 425 adults with type 2 diabetes responded. Of these, data from 41 respondents were excluded from the study due to low response quality in the survey instrument. They did not meet the 70% response requirement which was set as the limit for inclusion. Data were obtained at follow-up from 296 of the participants in the original T_1 sample (N = 378), indicating the drop out of 82 respondents in T_2 (n = 82). The follow-up group, for which both T_1 and T_2 data were available, constituted our longitudinal sample (n = 296). All of the respondents in T_2 had adequate response quality in the survey instrument. The same questionnaire administered by mail at T_1 was repeated at T_2. The respondents at T_2 received a reminder letter approximately one year from T_1, asking them to complete the postal questionnaire a second time and return it in a stamped envelope addressed to the researchers within three weeks of receiving the questionnaire.

2.3. Measures

2.3.1. Diabetes-related distress
In the present study, perceived diabetes-related dis- tress was assessed by the Problem Areas In Diabetes (PAID) scale developed by Polonsky et al. (1995). The PAID comprises 20 items covering frequently reported emo- tional states and produces a total score ranging from 0 to 100, with higher scores indicating greater distress. More- over, using 20 items, it captures the patient's perspective on the breadth and severity of emotional distress from living with diabetes (Welch et al., 2007), and it is commonly used for mapping diabetes-related problem areas and emotional distress. The respondents were asked to rate how much of a problem, on a five-point scale with options from '0 = not a problem' to '4 = serious problem,' they find each of the 20 issues raised to be. Examples of items are (1) 'worrying about the future and the possibility of serious complications,' and (2) 'feeling scared when you think about living with diabetes.' The scale has proved to be a useful measure to assess diabetes-related distress, and its responsiveness has been tested, supporting its sensitivity to change over time (Welch et al., 2003). Empirical studies have demonstrated the PAID to display good psychometric properties and to correlate strongly with a wide range of theoretically related constructs such as for example general emotional distress, depression and diabetes self-care behavior (Polonsky et al., 1995; Snoek et al., 2000a; Welch et al., 1997). The scale was originally not conceptualized as a multi-domain scale (Polonsky et al., 1995). Previous research supports using a total score (with one general 20-item factor) (Welch et al., 1997); although both two-factor and four-factor solutions have been reported (Sigurdardottir and Benediktsson, 2008; Snoek et al., 2000b). Moreover, a factor analysis conducted for the scale at the first assessment (Karlsen et al., 2012) indicated that PAID measures a uniform concept. Findings from another recent Norwegian study also support that all 20 items capture a uniform concept of diabetes-related distress (Graue et al., 2012). The PAID had a Cronbach's alpha of 0.95 at T_1 and of 0.95 at T_2.

2.3.2. Clinical variables

Self-reports asking the respondents about HbA1c, treatment regimen, diabetes-related complications, dis- ease duration and BMI determined clinical variables. HbA1c was determined by gathering responses from the participants about their most recent values. Treatment regimen was assessed by asking the respondents to indicate whether they were treated through diet only, oral medication or insulin. Diabetes-related complications were assessed through asking the respondents to indicate whether they have complications such as retinopathy, leg ulcers, neuropathy, heart/vascular disease, kidney disease or amputation of a leg. A dichotomous variable for complications was obtained by assigning a value of 1 to those who reported one or more diabetes complications and a value of 0 to those who did not report complications. Disease duration was scored as a continuous variable (in years). Finally, BMI was calculated as weight in kilograms divided by height in meters squared.

2.3.3. Support from health care professionals

A scale including 18 items was implemented to assess perceptions of support from health care professionals (physicians, nurses and other health care personnels). Eleven items derived from the patient questionnaire on empowerment (Karlsen et al., 2004) assessed perceptions of constructive support, and seven captured non-con- structive support developed by Oftedal et al. (2011). The scale focuses on experiences in routine diabetes follow-up consultations, especially on positive and negative aspects of guidance support. Respondents rated the degree to which they agreed with items such as, 'they listen to me and my concerns' and 'the way they told me that I have diabetes made me feel guilty' on a five-point Likert scale format, ranging from 'agree strongly' to 'disagree strongly.' The higher the scores were on positive items, the more the constructive support from the health care professionals was, and the higher the scores were on negative items, the more non-constructive the support was. Moreover, a factor analysis of items assessing support from health care providers conducted at the first assessment indicated a two factor solution (Karlsen et al., 2012). Item loadings on the two factors were in accordance with the intended dimensionality of this assessment. At T_1, Cronbach's alphas for the two subscales were 0.94 and 0.85, respectively.

2.3.4. Support from family members

Supportive and non-supportive family behaviors specific to diabetes were assessed using 14 items from the 16-item Diabetes Family Behavior Checklist (DFBC) developed by Schafer et al. (1986). The scale has proved to be a useful measure to assess family support for people suffering from type 1 or type 2 diabetes (Schafer et al., 1986; Trief et al., 1998). The respondents rated how often close relatives or significant others living with them provide constructive support or demonstrate non-supportive behavior. The scale includes response alternatives according to a five-point Likert scale: never, seldom, sometimes, often and very often (scores from 1 to 5). High scores on positive items indicated high perceived constructive support from family members/significant others; high scores on negative items indicated perceived high non-supportive behaviors. Additionally, a factor analysis of items assessing supportive and non-supportive family behaviors conducted at the first assessment indicated a two factor solution (Karlsen et al., 2012). Item loadings on the two factors were in accordance with the intended dimensionality of this assessment. At T_1, the subscale of positive items had a Cronbach's a of 0.79, whereas the subscale of negative items had a Cronbach's a of 0.78. Further specific documentation of the scale is given in Karlsen et al. (2012).

Control variables

Demographic information about age and gender was implemented as control variables. Age was scored as a continuous variable (in years). Gender was graded as follows: women = 1 and men = 2. In addition, diabetes-related distress assessed at the initial level at T_1 was implemented as a control variable.

2.4. Data analyses

The SPSS statistical package (version 18.0, Chicago, IL) (Norusis, 2011) was used to conduct the descriptive analyses, product moment correlations and multiple hierarchical regression analysis. The 0–100 total PAID score was computed by adding the responses of 0–4 and multiplying this sum by 1.25 (Polonsky et al., 1995; Welch et al., 1997). A drop-out analysis was undertaken by comparing the study variables in T_1 among respondents who completed the two assessments with those who only completed the T_1 assessment. Independent sample t-test and cross-tabulations including chi-square test were used to compare scores between the responders and non- responders. Paired t-test was used to compare mean scores in PAID between T_1 and T_2. The hierarchical multiple regression analysis was implemented to test the predictive influence of the study variables assessed at T_1 on PAID at T_2. Study variables were entered into the hierarchical regression in three steps. In the first step, only the control variables were entered, constituting model 1. Then clinical variables were added in model 2, and finally, all independent variables including variables assessing social support were entered in model 3. In order to calculate the degree to which the different independent variables predicts change in diabetes-related distress, the T_1 score of PAID was included as a control variable and the T_2 assessment of PAID as dependent variable. Moreover, bivariate correlations between independent and dependent variables were computed prior to the multiple regression. Statistical significance was established at $p = <0.01$ and $p = <0.05$. Missing data were handled by giving a missing item the mean score for the other items in each scale completed by the individual.

2.5. Ethical considerations

The Norwegian Regional Committee for Medical and Health Research Ethics (No. 055.08), the Norwegian Social Science Data Services NSD and the Privacy Ombudsman for Research (No. 18770) approved the study. Eligible patients attending the general practitioners and members of the Norwegian Diabetes Association were invited by letter to participate in the study. Information about the study, the two assessments at different time points, possibility of withdrawing at any time and the assurance that confidentiality was guaranteed were included in the letter that accompanied the questionnaire.

3. Results

The response rate and characteristics of the respondents participating in the longitudinal study at T_1 and T_2 as well as for those who did not participate in the second assessment at T_2 are provided in Table 1. In the longitudinal sample, the mean age of the participants was 59.0 years (SD = 8.3), their mean disease duration was 8.2 years (SD = 6.3) and their mean BMI was 29.6 (SD = 5.3). The majority of the participants were male (52.6%). In this total sample, 75% reported treatment with oral medication, and 27.4% reported insulin treatment. Those respondents who did not respond to the second assessment at T_2 (n = 82) differed significantly in mean age (55 years vs. 59 years, p < 0.01) and in percentages among those reporting one or more complications (62.1% vs. 50.0%, p < 0.05). Moreover, regarding the mean in diabetes-related distress, mean scores were marginally significantly lower in the longitudinal sample compared to the scores of those who did not respond in T_2 (M = 24.27; SD = 17.50 vs. M = 28.31; SD = 18.36, p = 0.054). Those who did not participate in T_2 did not differ in mean scores of the support variables compared with the longitudinal sample.

Characteristics of 296 respondents participating in the first and the second assessments (T_1 and T_2) and those not participating in T_2 (n = 82).

Characteristics	Respondents participating in T_1 and T_2		Respondents not participating in T_2	
	Count/mean (SD)	%	Count/mean (SD)	%
Respondents	296		82	
Male	155	52.6%	47	57.3%
Female	141	47.4%	35	42.7%
Age (years) mean (SD)	59 (8.33)		55 (9.30)[a]	
Disease duration (years) mean (SD)	8.2 (6.37)		7.7 (5.32)	
N reporting oral medication	230	75.0%	56	68.3%
N reporting insulin treatment	81	27.4%	24	30.7%
Body Mass Index (BMI) (kg/m2) mean (SD)	29.6 (5.33)		30.1 (5.17)	
HbA1c (%)	7.0 (1.01)		7.2 (1.15)	
N reporting ≥1 complications	148	50.0%	51	62.1%[a]
Diabetes-related distress (PAID) mean (SD)	23.25 (17.86)		28.31 (18.54)	
Constructive support from healthcare providers mean (SD)	3.98 (0.89)		3.89 (0.85)	
Non-constructive support from healthcare providers mean (SD)	2.35 (1.01)		2.32 (0.94)	
Supportive family behavior mean (SD)	2.71 (0.78)		2.63 (0.79)	
Non-supportive family behavior mean (SD)	1.75 (0.68)		1.90 (0.75)	

n = number of participants; SD = standard deviation.
[a] p < 0.05.

Mean scores and standard deviations for diabetes- related distress were slightly higher at T_1 (M = 24.27; SD = 17.50) compared to T_2 (M = 23.25; SD = 17.86) in the longitudinal sample. However, the difference in mean scores was not significant (p = 0.17).

Results from the correlation and the hierarchical multiple regression analyses for exploring the prospective relationships between the study variables at T_1 and the dependent variable at T_2 are presented in Table 2.

As can be seen in Table 2, diabetes-related distress assessed by the PAID at T1 exhibited a significant positive bivariate association as well as significant multivariate associations with the PAID at T2. When entering the control variables in model 1, at T1 PAID yielded a significant positive association, with the PAID score at T2 accounting for 54.3% of the variance in the PAID scores at T2. The same tendency between these variables was also found in models 2 and 3 in the regression analysis. Although a significant bivariate association for HbA1c with diabetes-related distress was found, the prospective analyses showed only non-significant multivariate associations between these variables in models 2 and 3. Moreover, in model 2, comprising the clinical variables, only disease duration predicted diabetes-related distress at T2. It should, however, be noted that this association was not found in model 3. In total, clinical variables added only 1.6% to the explained variance in scores for diabetes-related distress at T2. In the third model, the support variables were entered, leading to an increase of 2.8% in variance accounted for in diabetes-related distress, reflecting some predictive

influence of the independent variables on the PAID. The final model, including all independent variables, explained 58.6% of the variance of PAID at T2. Three of the support variables yielded significant bivariate correlations with scores on the PAID at T2, indicating that constructive behavior from health care professionals was associated with less distress, whereas non-constructive support from health care professionals and family members were associated with higher levels of distress. However, it should be noted that only 'constructive support from HCP' and 'non-supportive family behavior' yielded significant prospective multivariate associations with the dependent variable in the final model.

4. Discussion

Few studies have been designed to prospectively assess the predictive influence of essential clinical variables of diabetes regulation and perceived support on diabetes- related distress among adults with type 2 diabetes. Our descriptive results suggest only minimal reduction in mean scores in diabetes-related distress assessed one year later, compared with the scores at the first assessment. Of interest are also the significant and positive bivariate correlations as well as the prospective multivariate associations between diabetes-related distress assessed at the two time points, indicating relatively high stability in perceived distress during one year. A previous study showed significant and

Results from correlation (Pearson's r) and regression analysis (standardized beta weights (b) for prospective associations between independent variables at the first assessment (T_1) and the dependent variable PAID at the second assessment (T_2). Independent variables were entered hierarchically in sections: model 1 (control variables), model 2 (control and clinical variables) and model 3 (control, clinical and support variables). Number of participants = 296.

| | | Diabetes related distress at T_2 (PAID T_2) | | |
		Model 1	Model 2	Model 3
	r	b	b	b
Control variables				
Diabetes-related distress (PAID T_1)	0.74[b]	0.73[b]	0.74[b]	0.63[b]
Age (T_1)	-0.13[a]	-0.03	-0.06	-0.05
Gender (T_1)	-0.02	0.00	0.00	-0.03
Clinical variables				
Disease duration (T_1)	0.08		0.11[a]	0.08
Oral medication (T_1)	0.04		-0.02	-0.03
Insulin treatment (T_1)	0.11		-0.05	-0.01
Body mass index (BMI) (T_1)	0.08		-0.05	-0.08
HbA1c (T_1)	0.16[a]		0.05	0.02
Complications (T_1)	0.06		-0.05	-0.06
Support variables				
Constructive support from healthcare providers (T_1)	-0.37[b]			-0.10[a]
Non-constructive support from healthcare providers (T_1)	0.34[b]			0.05
Supportive family behavior (T_1)	-0.11			-0.05
Non-supportive family behavior (T_1)	0.38[b]			0.15[b]
R^2		0.543[b]	0.559[b]	0.586[b]
R^2 change			0.016	0.028[b]

[a] $p < 0.05$.
[b] $p < 0.01$.

relative strong associations between diabetes-related distress and coping styles (Karlsen et al., 2012). Combined, these findings may indicate that people with type 2 diabetes are likely to develop relatively stable perceptions of the challenges of living with diabetes that are related to habitual ways of dealing with stress. This also corresponds to general psychological literature (Carver et al., 1989; Costa et al., 1996; Hewitt and Flett, 1996), claiming that individuals do have consistent coping preferences or dispositions that are involved directly in the production and maintenance of adjustment and maladjustment. People with type 2 diabetes may therefore be less susceptible to the influence of the environment and find it difficult to change over time (Caspi et al., 2005).

The results from the multiple regression analyses showed that clinical variables were very weak predictors of diabetes-related distress, whereas perceived social support emerged as statistically significant but moderate predictors of distress. The same pattern was also found in a previous cross-sectional study (Karlsen et al., 2012). Moreover, our hypothesis of the predictive effect of clinical variables on diabetes-related distress received little support. This finding is somewhat consistent with previous research, showing only moderate associations between clinical variables and diabetes-related distress (Fisher et al., 2009; Polonsky et al., 1995; Welch et al., 1997).

The present study revealed a relatively weak predictive influence of perceived support on diabetes-related distress. Among the four variables of perceived support, only 'constructive support from health care professionals' and 'non-supportive family behavior' accounted for the modest amount of variance in diabetes-related distress. There was a weak but statistically significant negative prospective effect of perceived constructive support from health care professionals on the PAID. This finding somewhat supports our hypothesis that constructive support from health care professionals predicts better adjustment, indicating that support from health care professionals can instigate a more positive experience of living with type 2 diabetes. However, considered together with the relatively high stability of distress found in the present study, the weak prospective effect of this support may reflect that, among those struggling with type 2 diabetes, the habitual ways of living with the disease are hard to change. Subsequently, this may require more support or another kind of support than health professionals are currently able to provide. Moreover, as support from health care professionals is usually available only a few times a year, other kinds of support that intervene with everyday challenges may be more important for reducing diabetes-related distress. This may include the need for on-going support with more attention to emotional issues. The possibility of sharing thoughts and feelings with health care professionals or others may reduce negative emotions and lead to better emotional adjustment. According to Hunt et al. (1998), health care practitioners tend not to appreciate the complexity of managing type 2 diabetes and may therefore not treat this group with sufficient consideration. A previous study has also demonstrated that many professionals were not able to identify psychological problems and to provide the support the patients needed (Peyrot et al., 2005). On the other hand, our hypothesis of the predictive influence of non-constructive support from health care professionals on diabetes-related distress received no support. This is in contrast to a previous study that found relatively strong positive associations between the non-constructive dimension of HCP support and diabetes-related distress (Karlsen et al., 2012). Findings from the present study, however, do not support what the previously found association indicated that perceived non-constructive support from health care professionals causes diabetes-related distress. The present association could rather reflect that distress tones perceived support from health care professionals more negatively or that health care professionals respond in a way that is perceived less supportive by people who exhibit signs of struggle with type 2 diabetes. It is, however, likely that such an effect may have been established already in T_1. The non-significant prediction may thus be due to the fact that the possible negative effect does not escalate between the two points of measurements.

Finally, assumptions about the predictive influence of supportive family behavior on distress received no support in this study. Findings may reflect that perceptions of diabetes-related distress tend to be relatively stable, and this may also be the case for the supportive interactions with family members. Taken together with results from a previous cross-sectional study (Karlsen et al., 2012), indicating non-significant associations between supportive family behavior and diabetes-related distress, the present findings may suggest that diabetes-related distress is not easily affected by family support. However, the weak but significant prediction of non-supportive family behavior on diabetes-related distress found in this study sustains to a modest degree our assumption that non-supportive family behavior could lead to worse adjustment. This finding could suggest that negative behavior such as nagging and criticism from family members may give rise to more perceived problems with living with type 2 diabetes and thus increased feelings of distress. Even though family members have well-intended actions in supporting chronically ill patients, some of these actions could sometimes have unintended adverse effects and thus be perceived as non-supportive by the patient (Taylor, 2006). A recent study (Karlsen et al., 2012) revealed a similar pattern, indicating rather strong significant posi- tive associations between non-supportive family behavior and distress. This result shows interesting parallels with findings from other studies, suggesting that a low level of support among family members is likely to manifest itself in more negative social interactions, which are predictive of greater depression (Sacco, 1999; Sacco and Vaughan, 2006). However, more research is needed to clarify the predictive role of social support on diabetes-related distress among people with type 2 diabetes.

4.1. Methodological limitations

Several factors may limit the interpretation of these findings. First, the study entailed participants' reports of data and was, therefore, subject to recall bias. It should also be borne in mind that clinical variables are measured through self-report, and the validity of these measures could be questioned. The self-reported HbA1c is, however, unlikely to be subject to important systematic distortion, as it is a numerical value and is probably highly relevant for people with diabetes (Cox and Gonder-Frederick, 1992). Second, as the sample was not randomly selected, generalization of the findings may be limited. Third, although the PAID is considered to be sensitive to change over time (Welch et al., 2003), we found only small changes in diabetes-related distress over a one-year period in our study. The predictive effects of social support on diabetes-related distress may therefore be underestimated. In addition, the time interval between the two assessment points was one year. This may not have allowed for sufficient time to provide changes in diabetes-related distress.

In addition, the drop-out rate between T_1 and T_2 should be mentioned. We cannot rule out that attrition may have reduced the level of change in diabetes- related distress observed, since participants with low and relative stable levels of distress may be more likely to respond than those who have experienced a marked increase in diabetes related distress. On the other hand, previous findings (Karlsen et al., 2012) could indicate that people with type 2 diabetes are likely to develop relatively stable perceptions of the challenges of living with diabetes that are related to habitual ways of dealing with stress. Fourth, although the present study examined two essential dimensions of perceived social support, other potential social support-related variables were not included. This study, for example, did not assess the perceptions of the four major types of social support (emotional, affirmation, informational, tangible) and future research should address how these may differentially predict changes in diabetes-related distress. Finally, it should be noted that, despite the significant advantages that are associated with using a prospective design, findings from the present study do not provide conclusive evidence of the causal linkages between the predictors and diabetes-related distress (Pedhazur, 1982).

4.2. Implications for clinical practice

The present findings could be of interest for health care providers. Health care professionals should pay more attention to non-clinical factors such as social support when addressing diabetes-related distress. Thus, the findings are of relevance to the care of type 2 diabetes. They point to the importance of incorporating psychological aspects when supporting people with type 2 diabetes. This could have implications for the training programs of health care professionals working with this group of people in order to facilitate adaptation to the disease.

Health care professionals should also be aware of people's habitual and rather stable ways of dealing with stress that make them less susceptible to the influence of the environment. They should be attentive to this when choosing interventions aimed at reducing diabetes-related distress. Offering more constructive support and encouraging people to better manage their disease to prevent development of distress should also be considered. In helping people to reduce levels of distress, it is important to enhance positive social interactions with health care professionals and involve family members in a supportive manner. Yet, one should note the weak predictive influence of support on diabetes-related distress. This may imply that it is challenging for people with type 2 diabetes to reduce distress and that such a reduction is not easily influenced by changes in support within the environment. Thus, in order to reduce diabetes-related distress, one must establish long-lasting, high quality support. In this respect, it may be important to develop methods of involving and educating family members to become strong sources of constructive support. Professionals should also consider ways to educate family members as sources of positive support for diabetes care and effectively utilize these resources when planning health care programs for people with type 2 diabetes. This is an issue that requires further research.

5. Conclusion

This prospective study contributes additional insight into the predictive influence of essential clinical variables of diabetes regulation and perceived social support from health care professionals and family members on diabetes- related distress in a longitudinal sample of adults with type 2 diabetes. Descriptive results and findings from the correlations as well as the prospective multivariate associations indicate only small changes in individual diabetes-related distress over a period of one year. This may reflect that people with type 2 diabetes have developed rather habitual and stable ways of dealing with stress, which are difficult to change. Replication in different samples with longer follow-up periods is needed to make firm conclusions. One should note that diabetes- related distress is only to a fairly small degree predicted by clinical variables, whereas social support emerged as a statistically significant although moderate predictor. Health care professionals should therefore be attentive to the fact that assisting people to manage diabetes-related challenges and change lifestyles is complex and may require tailor-made, ongoing support. A greater elucidation of how the different dimensions of social support and other aspects of social capital may influence diabetes-related distress, as well as, how health care professionals and family may serve as agents for improving such support and capital are also important issues for further research.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ijnurstu.2013.06.016.

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