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Diabetes-related symptoms and negative mood in participants of a targeted population-screening program for type 2 diabetes: The Hoorn Screening study

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Abstract

Objective: To determine the level of diabetes-related symptom distress and its association with negative mood in subjects participating in a targeted population-screening program, comparing those identified as having type 2 diabetes vs. those who did not. *Research design and methods*: This study was conducted within the framework of a targeted screening project for type 2 diabetes in a general Dutch population (age 50–75 years). The study sample consisted of 246 subjects, pre-selected on the basis of a high-risk profile; 116 of whom were subsequently identified as having type 2 diabetes, and 130 who were non-diabetic subjects. Diabetes-related symptom distress and negative mood was assessed ~2 weeks, 6 months, and 12 months after the diagnosis of type 2 diabetes, with the Type 2 Diabetes Symptom Checklist and the Negative well-being sub scale of the Well-being Questionnaire (W-BQ12), respectively. *Results*: Screening-detected diabetic patients reported significantly greater burden of hyperglycemic ($F = 6.0$, df $= 1$, $p = 0.015$) and of fatigue ($F = 5.3$, df $= 1$, $p = 0.023$) symptoms in the first year following diagnosis type 2 diabetes compared to non-diabetic subjects. These outcomes did not change over time. The total symptom distress (range 0–4) was relatively low for both screening-detected diabetic patients (median at ~2 weeks, 6 months, and 12 months; 0.24, 0.24, 0.29) and non-diabetic subjects (0.15, 0.15, 0.18), and not significantly different. No average difference and change over time in negative well-being was found between screening-detected diabetic patients and non-diabetic subjects. Negative well-being was significantly positive related with the total symptom distress score (regression coefficient $\beta = 2.86$, 95% CI 2.15–3.58). *Conclusions*: The screening-detected diabetic patients were bothered more by symptoms of hyperglycemia and fatigue in the first year following diagnosis type 2 diabetes than non-diabetic subjects. More symptom distress is associated with increased negative mood in both screening-detected diabetic patients and non-diabetic subjects.

Key words: Diabetes-related symptoms, Negative mood, Screening, Type 2 diabetes

Introduction

Type 2 diabetes is a chronic disease with a long preclinical phase. It has been suggested that hyperglycemia occurs at least 4–7 years before clinical diagnosis [1]. Identification of patients at an early stage of the disease, i.e. in the asymptomatic phase of type 2 diabetes could prove to be of importance in counteracting diabetes-related complications due to delay of treatment. Screening high-risk patients has been advocated by the American Diabetes Association [2]. Several reports suggest that screening programs targeting individuals with multiple diabetes risk factors (i.e. advanced age, obesity, and family history of diabetes) may be worthwhile [3–5]. The value of

screening for type 2 diabetes in the general population is subject to debate [6–9].

The issue of symptom distress in type 2 diabetes is relevant for two reasons. First, diabetes symptom distress plays an important role in the detection of the disease and help-seeking behavior. It is likely that the majority of newly diagnosed patients in clinical practice are detected and tested for type 2 diabetes because of reported diabetes-related symptoms. This is not the case in a screening setting, where people are believed to be asymptomatic and thus unaware of their health problem. To date, the actual 'asymptomatic' status of participants of a targeted screening program has never been documented. Second, there is growing appreciation of the importance of the subjective burden of symptoms (symptom distress) in the context of the multidimensional concept of HRQoL [10]. It is hypothesised that it is primarily the bothersomeness of a particular complaint or symptom that determines HRQoL [11]. It is important to note that besides actual blood glucose levels, symptom perception is determined by cognitive and emotional responses, particularly negative affectivity [12, 13]. Whether symptom reporting in newly diagnosed diabetes patients is related to negative affect is not known. In an early study in newly diagnosed persons with type 2 diabetes by Palinkas et al., elevated depressive symptomatology appeared not to be the result of the diabetes *per se*, but rather the awareness of the individuals having type 2 diabetes [14]. Although the causal relationship is not yet clear, depression in diabetes [15–19], is associated with hyperglycemia [20]. Moreover, depression was found to be an independent predictor of diabetes symptom reporting [21]. Some studies suggest that depression is an independent predictor of developing type 2 diabetes [22–24].

Research into the association between diabetes symptoms and negative affect in the early stages of the disease is therefore warranted. From 1998 to 2000 a population-based, targeted screening program for type 2 diabetes in the general Dutch population was conducted. Within the framework of this screening project, we assessed diabetes-related symptom distress and negative mood. The present study compared prospectively diabetes-related symptom distress and negative mood in screening-detected subjects and a group with a high-risk profile for diabetes but without hyperglycemia, after participation in a targeted population-screening program. Our goal was to determine if differences exist in diabetes-related symptom distress and negative affect between both groups and to detect changes in the first year following the diagnosis of type 2 diabetes.

Research design and methods

Recruitment

The study sample was recruited from the participants of a screening project in the general Dutch population of the West-Friesland region. The screening procedure and sample were described in detail by Spijkerman et al. [25]. Briefly, a total of 11,679 subjects, all 50–75-year-old inhabitants, registered in three local municipalities, were invited to take part in a targeted screening for type 2 diabetes. People received study information along with the Symptom Risk Questionnaire (SRQ) [26]. The SRQ contains questions about: age, obesity, gender, report of pain during walking with need to slow down, shortness of breath when walking with people of the same age, frequent thirst, parent or sibling with diabetes, use of anti-hypertensive drugs, and use of a bicycle for transportation. To identify individuals at increased risk for undiagnosed type 2 diabetes, participants with a SRQ score >6, indicating high risk, were invited for a fasting capillary blood glucose measurement. In case of a capillary glucose >5.5 mmol/l, venous fasting plasma glucose was determined, and within 2 weeks a 75 g oral glucose tolerance test was performed for diagnostic purposes. The WHO criteria of 1999 were used for diagnosis; fasting plasma glucose ≥7.0 mmol/l on two separate occasions, or a 2-h plasma glucose level ≥11.1 mmol/l.

Data on diabetes-related symptom distress and negative mood were measured by follow-up questionnaires and completed by both groups at home, approximately 2 weeks (*T*1), and 6 months (*T*2) and 12 months (*T*3) following the test result (diabetes yes/no). To maximize the response, a reminder was sent after 2 weeks. Individuals who did not return their questionnaires were excluded from follow-up. All participants gave written informed consent and the Ethical Review

Committee of the VU University Medical Centre approved the study.

Study sample

The initial study sample consisted of 319 subjects, all with a high-risk score on the SRQ; 156 of whom were subsequently detected with type 2 diabetes, and 163 who were non-diabetic subjects. Completed questionnaires on diabetes-related symptom distress and negative mood at ~2 weeks following diagnosis, and 6 months, and 12 months follow-up, respectively, were available for 116 (74%) of the 156 included screening-detected diabetic patients and 130 (80%) of the 163 included non-diabetic subjects

Diabetes-related symptom distress

To determine symptom distress, we used the revised version of the Type 2 Diabetes Symptom Checklist [27], which refers to the month preceding the visit. The presence of diabetes-related symptoms is measured as Yes/No Symptom occurred, and if Yes, the perceived burden is indicated on a 5-point Likert-scale from 0 ('not at all') to 4 ('extremely'). The Type 2 Diabetes Symptom Checklist consists of 34 symptom items covering eight dimensions: hyperglycemic (4 items), hypoglycemic (3 items), polyneuropathic pain (4 items), polyneuropathic sensory (6 items), psychological fatigue (4 items), psychological cognitive distress (4 items), cardiovascular (4 items), and ophthalmological (5 items) symptoms. The eight subscale scores are calculated by summating the item scores, divided by the number of items of that dimension. The Type 2 Diabetes Symptom Checklist total score is calculated by summation of all item scores divided by 34, with higher scores indicating more symptom distress. Cronbach's alpha ranged from 0.69 for hypoglycemia to 0.91 for fatigue in the measurement ~2 weeks after the diagnosis.

Negative mood

We operationalized negative mood by means of the Negative well-being sub scale (NWB) of the Dutch short version of the Well-being Questionnaire (W-BQ12). The NWB consists of 4-items scored on a 0–3 Likert scale (0 = best, 12 = worst score) [28, 29], pertaining to the past weeks. The NWB includes two depression and two anxiety items, which originally stem from Zung's Self-rating Depression Scale [30] and Self-rating Anxiety Scale [31] respectively. Based on mean ($\pm$SD) NWB scores, found in Dutch Type 2 diabetes patients with complications (2.7 $\pm$ 2.9) and without complications (1.9 $\pm$ 2.4), a score >4 indicates elevated depressive symptomatology and is used as a cut-off [29]. Cronbach's alpha of the NWB ~2 weeks after the diagnosis was 0.87.

Analyses

Statistical analyses were performed using SPSS 11.5 for Windows. The baseline characteristics of screening-detected diabetic patients and non-diabetic subjects were compared using Student's *t*-test for continuous variables and χ^2-tests for categorical variables. The Type 2 Diabetes Symptom Checklist scores were presented as mean, median and 75th percentile values. The negative well-being scores were presented as means and standard deviation. Based on the central limit theorem [32] we used multivariate analyses of variance (MANOVA) for repeated measurements to assess differences on the primary outcome variables of the Type 2 Diabetes Symptom Checklist and Negative well-being between screening-detected diabetic patients and non-diabetic subjects. From the design a group by time interaction effect (i.e. "is the change over time in outcome variable different for the compared groups?") and a general group effect (i.e. "is there on average a difference in outcome variable between the compared groups?") can be obtained. In addition, to estimate the size effects confirmatory linear generalized estimating equations (GEE) analysis were performed with STATA. Spearman's correlations and linear regression analyses were applied between NWB and diabetes related symptom distress variables. For all statistical testing, we used two-sided hypothesis testing with an alpha level of 0.05.

Results

The baseline characteristics and blood glucose levels of the screening-detected diabetic patients

and non-diabetic subjects are presented in Table 1. Screening-detected diabetic patients had significantly higher total Symptom Risk Questionnaire scores compared to non-diabetic subjects. By definition, screening-detected diabetic patients had significant higher blood glucose levels compared with non-diabetic subjects. Comparison of baseline characteristics and blood glucose levels of screening-detected diabetic patients and non-diabetic dropouts with those subjects with complete follow-up questionnaires revealed no differences. Both groups were primarily Caucasian (>99%).

Diabetes-related symptom distress

The proportion of screening-detected diabetic patients and non-diabetic subjects reporting the occurrence of diabetes-related symptoms measured with the Type 2 Diabetes Symptom Checklist at $T1$, $T2$ and $T3$ are presented in Table 2. Approximately 2 weeks after the screening, the proportion of subjects reporting that no symptoms occurred on any of the Type 2 Diabetes Symptom Checklist sub dimensions, varied from 26% to 60% for the screening-detected diabetic patients and 42–72% for the non-diabetic subjects. The proportion of screening-detected diabetic patients and non-diabetic subjects cases that reported no symptoms at all, varied from 4% to 10% and 13–19%, respectively, on any of the measuring moments.

Descriptive statistics of the Type 2 Diabetes Symptom Checklist and Negative well-being (NWB) for screening-detected diabetic patients and non-diabetic subjects at $T1$, $T2$ and $T3$ are presented in Table 3. When looking at the subjective burden of the occurred symptoms, the low median and 75th percentile values of the Type 2 Diabetes Symptom Checklist outcomes indicate that the distribution of symptom distress scores is highly skewed. The 25th percentile value for all eight Type 2 Diabetes Symptom Checklist sub dimensions, of both groups at any time point is 0.0, except for the Type 2 Diabetes Symptom Checklist total scores. The percentage of patients without any symptom distress at $T1$, $T2$ and $T3$, represented by the proportion of zero-scores on the Type 2 Diabetes Symptom Checklist total score, was 9.5%, 10.3%, and 12.1% for screening-detected diabetic patients and 17.7%, 22.3% and 20.8% for non-diabetic subjects, respectively.

The Type 2 Diabetes Symptom Checklist total scores appear to be stable in time, relatively low at any time point for both screening-detected diabetic patients and non-diabetic subjects, and overall slightly higher for screening-detected diabetic patients, though not significant. The highest median scores in screening-detected diabetic patients were found at $T1$ for ''fatigue'', ''hyperglycemic'' and ''cognitive distress'' symptoms; with ''lack of energy'' (55%), ''dry mouth'' (43%), and ''sleepiness or drowsiness'' (38%), reported as most burdensome (≥1) item, respectively. The highest median scores in non-diabetic subjects were found for ''fatigue'' and ''cardiovascular'' symptoms with ''increasing fatigue in the course of the day'' (44%)

Table 1. Baseline characteristics and blood glucose levels of the screening-detected diabetic patients (SDM) and the non-diabetic subjects (ND)

	SDM	ND	*p*
N	116	130	–
Sex[a] (% male)	56.9	50.8	0.337
Age[b] (years)	63.2 ± 7.3	61.9 ± 7.3	0.182
BMI (kg/m^2)	29.0 ± 5.1	28.0 ± 4.0	0.092
Total Symptom Risk Questionnaire score	13.1 ± 4.3	11.5 ± 3.8	0.003
Fasting capillary glucose (mmol/l)	7.3 ± 1.9	5.9 ± 0.3	0.000
Fasting plasma glucose (mmol/l)	8.5 ± 2.1	6.5 ± 0.5	0.000
2nd fasting plasma glucose (mmol/l)	7.9 ± 0.9	6.3 ± 0.8	0.000
2-h post-load plasma glucose (mmol/l)	12.9 ± 3.7	6.6 ± 1.9	0.000

Data are *n*, means ± SD or %.
[a]χ^2 tests were used for categorical variables.
[b]Student's *t*-test was used for continuous variables.

Table 2. Screening-detected diabetic patients (SDM; $n = 116$) and non-diabetic subjects (ND; $n = 130$) reporting diabetes-related symptoms measured with the Type 2 Diabetes Symptom Checklist (DSC-R) approximately 2 weeks, 6 months, and 12 months after the test result

DSC-R	~2 Weeks			6 Months			12 Months		
	SDM %	ND %	*p*	SDM %	ND %	*p*	SDM %	ND %	*p*
Hyperglycemic	69	49	0.001	62	43	0.003	57	49	0.229
Hypoglycemic	40	28	0.047	35	27	0.154	37	28	0.116
Neuropathic pain	45	32	0.032	36	34	0.698	38	39	0.946
Sensibility	43	39	0.538	41	40	0.934	39	41	0.752
Fatigue	74	57	0.005	74	58	0.007	74	62	0.035
Cognitive distress	62	49	0.043	64	45	0.004	60	52	0.211
Cardiovascular	65	59	0.319	60	58	0.776	58	61	0.631
Ophthalmological	55	41	0.024	47	41	0.295	47	39	0.196
DSC-R total score	96	83	0.002	92	82	0.014	91	86	0.289

Data for the eight DSC-R subscales and the DSC-R total score are percentages.
χ^2 tests were used.

and "shortness of breath during exercise" (43%) reported as most burdensome item at *T*1, respectively.

Results of MANOVA for repeated measurements on the Type 2 Diabetes Symptom Checklist and NWB outcome variables showed that screening-detected diabetic patients reported to have been significantly more burdened by hyperglycemic ($F = 6.0$, df = 1, $p = 0.015$) and fatigue ($F = 5.3$, df = 1, $p = 0.023$) symptoms in the first year following diagnosis type 2 diabetes, compared to non-diabetic subjects. Confirmatory linear GEE analysis showed the same results (Table 4). No significant group by time interactions were found, indicating that these differences between screening-detected diabetic patients and non-diabetic subjects did not change over time.

Negative mood

The number of cases with high (>4) NWB scores at *T*1, indicative for elevated depressive

Table 3. The Type 2 Diabetes Symptom Checklist (DSC-R) and Negative well-being scores for screening-detected diabetic patients (SDM) and non-diabetic subjects (ND) approximately 2 weeks, 6 months, and 12 months after the test result

	SDM ($n = 116$)			ND ($n = 130$)		
	~2 Weeks	6 Months	12 Months	~2 Weeks	6 Months	12 Months
DSC-R[a]						
Hyperglycemic	0.49 / 0.25 (0.75)	0.44 / 0.25 (0.50)	0.47 / 0.25 (0.50)	0.31 / 0.00 (0.50)	0.28 / 0.00 (0.50)	0.32 / 0.00 (0.50)
Hypoglycemic	0.23 / 0.00 (0.33)	0.22 / 0.00 (0.33)	0.26 / 0.00 (0.58)	0.16 / 0.00 (0.00)	0.16 / 0.00 (0.08)	0.18 / 0.00 (0.39)
Neuropathic pain	0.28 / 0.00 (0.25)	0.26 / 0.00 (0.25)	0.23 / 0.00 (0.25)	0.26 / 0.00 (0.25)	0.24 / 0.00 (0.25)	0.31 / 0.00 (0.50)
Sensibility	0.22 / 0.00 (0.17)	0.21 / 0.00 (0.33)	0.24 / 0.00 (0.33)	0.24 / 0.00 (0.33)	0.24 / 0.00 (0.33)	0.26 / 0.00 (0.33)
Fatigue	0.77 / 0.50 (1.19)	0.69 / 0.50 (1.00)	0.77 / 0.50 (1.25)	0.54 / 0.25 (0.75)	0.52 / 0.25 (0.75)	0.54 / 0.25 (0.75)
Cognitive distress	0.46 / 0.25 (0.75)	0.43 / 0.25 (0.50)	0.47 / 0.25 (0.75)	0.35 / 0.00 (0.50)	0.30 / 0.00 (0.50)	0.35 / 0.00 (0.50)
Cardiovascular	0.44 / 0.25 (0.50)	0.38 / 0.25 (0.50)	0.38 / 0.25 (0.75)	0.36 / 0.25 (0.50)	0.33 / 0.25 (0.50)	0.33 / 0.25 (0.50)
Ophthalmological	0.31 / 0.20 (0.40)	0.31 / 0.00 (0.40)	0.31 / 0.00 (0.40)	0.25 / 0.00 (0.20)	0.22 / 0.00 (0.20)	0.22 / 0.00 (0.20)
DSC-R total score (0–4)	0.39 ± (0.39)	0.36 ± (0.38)	0.38 ± (0.40)	0.31 ± (0.43)	0.28 ± (0.36)	0.32 ± (0.44)
	0.24 (0.12–0.55)	0.24 (0.09–0.50)	0.29 (0.10–0.50)	0.15 (0.05–0.42)	0.15 (0.03–0.41)	0.18 (0.03-0.38)
Negative mood						
Negative well-being	2.1 ± (2.7)	1.9 ± (2.7)	1.9 ± (2.6)	1.9 ± (2.5)	1.8 ± (2.5)	2.0 ± (2.5)

Data for the eight DSC-R subscales are mean / median (75th percentile); data for the DSC-R total score are mean ± (SD), median (inter-quartile range); data for Negative well-being are mean ± (SD).
[a]The 25th percentile value for all eight DSC-R subscales, of both SDM and ND at any time point is 0.0.

Table 4. Generalized estimating equations (GEE) analysis for the Type 2 Diabetes Symptom Checklist (DSC-R) and Negative well-being variables between screening-detected diabetic patients (SDM; $n = 116$) and non-diabetic subjects (ND; $n = 130$)

	General group effect[a]			Interaction group × time[b]					
				*T*1 vs. *T*2			*T*1 vs. *T*3		
	coef	(95% CI)	*p*	Coef	(95% CI)	*p*	coef	(95% CI)	*p*
DSC-R									
Hyperglycemic	−0.18	(−0.34 to −0.03)	0.02	0.02	(−0.10 to 0.13)	0.78	0.03	(−0.09 to 0.15)	0.62
Hypoglycemic	−0.06	(−0.16 to 0.03)	0.20	0.01	(−0.08 to 0.09)	0.84	−0.01	(−0.10 to 0.07)	0.76
Neuropathic pain	−0.02	(−0.16 to 0.11)	0.74	0.00	(−0.10 to 0.11)	0.96	0.11	(0.00 to 0.22)	0.05
Sensibility	0.01	(−0.10 to 0.13)	0.83	0.02	(−0.08 to 0.12)	0.73	0.01	(−0.09 to 0.12)	0.85
Fatigue	−0.23	(−0.44 to −0.02)	0.03	0.05	(−0.09 to 0.19)	0.46	0.02	(−0.13 to 0.17)	0.81
Cognitive distress	−0.11	(−0.26 to 0.04)	0.15	−0.02	(−0.12 to 0.08)	0.72	−0.00	(−0.12 to 0.12)	0.99
Cardiovascular	−0.07	(−0.22 to 0.07)	0.33	0.02	(−0.10 to 0.14)	0.75	0.07	(−0.04 to 0.18)	0.21
Ophthalmological	−0.06	(−0.19 to 0.06)	0.36	−0.00	(−0.12 to 0.11)	0.96	−0.04	(−0.19 to 0.10)	0.56
DSC-R total score (0–4)	−0.08	(−0.19 to 0.02)	0.10	0.01	(−0.06 to 0.08)	0.73	0.02	(−0.05 to 0.10)	0.57
Negative mood									
Negative well-being	−0.23	(−0.89 to 0.42)	0.49	0.11	(−0.39 to 0.60)	0.66	0.30	(−0.22 to 0.82)	0.25

[a]General group effect: a positive regression coefficient indicates a higher value of the particular variable at baseline for the non-diabetic subjects.
[b] Interaction group × time: a positive regression coefficient indicates that the non-diabetics show a sharper increase (or a less sharp decrease) than the screening-detected diabetic patients.

symptomatology, were comparable for both groups; 22 (19%) of the screening-detected diabetic patients and 22 (17%) of the non-diabetic subjects. Spearman's correlations were applied between NWB and diabetes related symptom distress variables. NWB was significant ($p = 0.01$) positively related with the Type 2 Diabetes Symptom Checklist total score ($r = 0.45$) at *T*1, and varied between 0.16 ($p = 0.05$) for polyneuropathic sensory symptoms and 0.55 ($p = 0.01$) for hypoglycemic symptoms. Additional linear regression analysis confirmed the positive relationship between NWB with the Type 2 Diabetes Symptom Checklist total score (regression coefficient $\beta = 2.86$, 95% CI 2.15–3.58). MANOVA for repeated measurements showed no average difference and change over time in differences in NWB between screening-detected diabetic patients and non-diabetic subjects.

Additionally, we have looked at the association between NWB at T1 and fasting capillary glucose, plasma glucose and 2nd fasting plasma glucose. In the total group Pearsons correlations varied from $r = -0.036$ to $r = 0.045$ and its non-parametric equivalent Spearman ρ varied from $\rho = -0.006$ to $\rho = 0.053$. Comparable correlations were found if we looked at the association for screening-detected diabetic patients and non-diabetic subjects independently.

Discussion

In this prospective study we report on diabetes-related symptoms in relation to negative mood in subjects who participated in a targeted population-screening program for type 2 diabetes. Despite significantly higher blood glucose levels for the screening-detected diabetic patients compared to non-diabetic subjects, the overall low level of symptom distress for the screening-detected diabetic patients confirms the 'asymptomatic' stage of the disease [1], and supports its silent [33], insidious character.

Interestingly, screening-detected diabetic patients did report significantly more hyperglycemic and fatigue symptom distress in the first year following diagnosis of type 2 diabetes, compared to non-diabetic subjects, a difference that remained stable over time. Apparently the screening-

detected diabetic patients did experience some symptoms but did not attribute these to the presence of type 2 diabetes. How can this be explained? First, this hyperglycemia unawareness [34] may be the result of the long phase of mild hyperglycemia which is well tolerated by the patient and often underestimated by the physician [35]. One previous study in people with type 2 diabetes diagnosed in clinical practice indicates that diabetes symptoms do occur but are mostly ignored. When systematically questioned, 93% of the newly diagnosed patients reported classic symptoms; 40% had had these symptoms for 1 year or more [36]. This failure to recognize symptoms may reflect the general public's lack of knowledge of the symptoms of diabetes [37]. Second, hyperglycemia is often accompanied by non-specific symptoms, such as an overall sense of fatigue and sleepiness or drowsiness, which indeed in our study occurred in 52% and 42% of the screening-detected diabetic patients, and 39% and 32% of the non-diabetic subjects respectively approximately 2 weeks after the test result. The interpretation of these ''vague'' symptoms is further complicated by its relatively strong association with negative affect.

In this study we found no significant average difference and change over time in negative affect between screening-detected diabetic patients and non-diabetic subjects. In both groups just less than 20% of the subjects reported elevated levels of negative affect. The fact that non-diabetic patients reported levels of negative affect equal to screening-detected diabetic patients, could be explained by their high cardiovascular risk profile which is known to be associated with depression [38]. Indeed, in a recent population based study, cardiovascular complications were identified as the main determinants of elevated depression in Type 2 diabetes [19].

The data presented in this paper provide evidence of the reliability and validity of the revised version of the Type 2 Diabetes Symptom Checklist [27], in a population screening setting. The Type 2 Diabetes Symptom Checklist scores correspond with the higher blood glucose levels and the total SRQ-scores for screening-detected diabetic patients compared to non-diabetic subjects. Although a closer look at the data showed that none of the independent SRQ variables differed significantly between the groups. The scales show similar degrees of internal consistency to those previously reported [27, 39], and also the stability of the results in time seem tot support the Type 2 Diabetes Symptom Checklist properties. However, confirmation in other populations is needed.

Our results have clinical implications. There are many reasons why people gain access to health care, but the most common reason for seeking medical help is the experience of a symptom [40]. The long phase of mild hyperglycemia, lack of knowledge and the non-specificity of symptoms explain why medical help is not sought by the screening-detected diabetic patients. Great efforts may be required to encourage adequate diabetes-related symptom appraisal. We previously reported that higher age, obesity and taking antihypertensive drugs did not translate into a higher perceived risk in screening-detected participants [41]. Our results could be used to refine diabetes information strategies that can facilitate early recognition of signs and symptoms in the general elderly population. An advertising campaign initiated by the British Diabetic Association, showed that it is possible to raise the public knowledge of diabetes symptoms without inducing fear of diabetes or anxiety about the symptoms [42]. We support the authors concluding remark that its potential for achieving earlier detection of type 2 diabetes should be evaluated.

In summary, although the overall diabetes-related symptom distress was relatively low for both screening-detected diabetic patients and non-diabetic subjects, screening-detected diabetic patients were bothered more by symptoms of hyperglycemia and fatigue in the first year following diagnosis type 2 diabetes than non-diabetic subjects. More symptom distress is associated with increased negative mood in both screening-detected diabetic patients and non-diabetic subjects, further complicating early detection based on symptom reporting.

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