Prevalence of Diabetes Distress among People with Type 2 Diabetes at Primary Health Care in Qatar: A cross-sectional Study

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Abstract

Background: Overwhelming demands of living with diabetes may lead to diabetes distress. It is linked to poor glycemic control which may result in high morbidity, mortality and increased health care costs. Our aim is to determine the prevalence of diabetes distress among people with type 2 diabetes and the associated factors.

Subjects and methods: A cross-sectional study with a sample size of 350 was conducted on type 2 diabetes people aged 30 - 65 years at West Bay Health Centre in Qatar. We used non-probability convenience sampling technique and written consent was secured from participants who met inclusion and exclusion criteria. Interviews were performed to fill out the diabetes distress scale DDS-17 which involves 4 subscales; emotional burden, physician distress, regimen distress and interpersonal distress. Mean item score of 2.0 - 2.9 was considered as moderate distress and ≥ 3.0 was considered as high distress. Approval notice was obtained from Research Committee. We used SPSS version 23 for data analysis.

Results: Overall prevalence of diabetes distress was 40.3% and expected to range between 35.2% and 45.5% with 95% confidence. Participants with high distress constituted 15.1%. For subscales; regimen distress had the highest prevalence (46.3%), followed by emotional burden (43.4%), interpersonal distress (38.6%), and physician distress (35.1%). A multivariate discriminant model to predict study participants with diabetes distress showed association in the following order of importance; Qataris/Arabs nationality, female gender, poor control of diabetes, receiving injections with treatment, obesity grade 2 and 3, age group ≥45 years, intensive diabetes control and being diagnosed with retinopathy. The discriminant model was statistically significant and able to classify individuals into distressed and non-distressed groups with 62% overall accuracy.

Conclusions: This study is the first of its kind in Qatar. The significant high prevalence highlights the importance of regular screening of diabetes distress, especially for those at high risk.

Key words: Diabetes distress, prevalence, Qatar

Introduction

Diabetes mellitus is a common metabolic disorder, characterized by high levels of blood glucose. Among the different types of the disease, type 2 diabetes mellitus is the most common, representing about 91% of total cases [1]. Diabetes mellitus has profound negative impacts on emotional and psychological well-being.

Diabetes distress overlaps with several conditions such as depression, anxiety, and stress but is distinct from clinical depression. Unlike depression, there is a significant relationship between diabetes distress and high levels of HbA1c [2]. It refers to worries, frustrations, concerns and emotional burdens that diabetics experience when managing a demanding chronic disease like diabetes [3]. Concerns related to diabetes distress include; general emotional distress, disordered eating, fear of hypoglycemia, and fear of short and long-term complications of diabetes [4]. A longitudinal study done by Fisher and his colleagues [5] concluded; the prevalence of affective and anxiety disorders was higher among people with diabetes compared to the general population. The persistence of diabetes distress over time was significantly greater than the persistence of affective and anxiety disorders, which tended to be episodic. This persistence strengthens the importance of diabetes distress screening at each patient visit, not just at specific intervals especially for high risk categories like females, younger adults, and those with comorbidities and/or complications.

In Qatar, the prevalence of diabetes mellitus was 16.7% [6], almost double that of the global estimate of 9.3% prevalence rate [7]. According to the results of a standardized online literature search using PubMed, Microsoft Academic and Google Scholar search engines targeting the term diabetes distress, no study has been done before in Qatar about diabetes distress and its prevalence. Determining the magnitude of the problem and the associated factors among people with type 2 diabetes will help to raise the awareness of the physicians to this important problem and motivate them to screen and address it on regular basis. This strategy may prove helpful to prevent further psychological deterioration and associated medical complications among diabetics. We believe that this study will have a positive impact on diabetes standards of care, diabetes control and better cost-effectiveness in health care.

Materials and Methods

1. Study Design
A cross-sectional study.

2. Setting
The study was executed at family medicine clinics at West Bay Health Center during the one-year study period extending from February 2019 - February 2020. This is one of 27 primary health care centers currently operated by the Primary Health Care Corporation (PHCC) in Qatar. Diabetes distress scale for type 2 diabetes DDS17 [8] was used. This valid and reliable tool involves 4 subscales; emotional burden, physician distress, regimen distress and interpersonal distress. Mean item score of 2.0 - 2.9 is considered as moderate distress, and ≥ 3.0 considered as high distress. A moderate or high distress are considered worthy of clinical attention.

The study protocol was approved for ethics and science by the Research Committee of PHCC. Informed written consent was secured from all study participants. A personal (face to face) interview was used to complete the questionnaire forms (English and Arabic translated version). Diabetes control was assessed according to American Diabetes Association, Standards of Medical Care in Diabetics - 2018 [9]. Active medications, recent ophthalmologist notes and HbA1c levels were extracted from the electronic medical recording system maintained by PHCC (Cerner Millennium).

3. Participants
Only people with type 2 diabetes were enrolled in the study. The reason for this selection is that the prevalence of diabetes distress is different for type 1 and type 2 diabetes, and the scales used for each type are also different. Adults aged 30 - 65 years were targeted in this study, since type 2 diabetes is more common among this age group. In addition, elderly people more than 65 years old may have multiple comorbidities, which might confound any observed association for diabetes distress.

Some factors may be considered as confounders and were therefore excluded from sampling. They included: end stage renal failure, Kidney/pancreas transplant, any condition that changes red blood cell turnover as it affects HbA1c, pregnant women, alcoholics, any patient diagnosed with cancer or any terminal illness, patients with learning difficulties, patients younger than 30 and older than 65 years and patients with language barrier and no staff available for translation.

4. Sampling Technique
Non-probability convenience sampling technique.

5. Study Size

The calculation of sample size was based on formula for estimating a single proportion, which is suitable for a cross-sectional study [10]. The formula used was:

$$x = Z(^{c}/_{100})^{2} r(100-r)$$

$$n = {}^{N\,x}/_{((N-1)\,E^{2} + x)}$$

$$E = \text{Sqrt}\,[{}^{(N-n)\,x}/_{n(N-1)}]$$

N is the population size, r is the fraction of responses that we are interested in (estimated proportion), and Z(c/100) is the critical value for the confidence level c. The population size (N) is 3,831. This is the number of type 2 diabetes patients who attended West Bay Health Centre in 2018. This information was obtained from Business and Intelligence Department at PHCC.

The estimated proportion of type 2 diabetics with distress (fraction of responses that we are interested in) was set at 50%. This would result in the largest possible sample size, since no previous studies in Qatar were available to give an estimate for this figure. The calculated sample size was 350 for estimating the proportion of diabetics with distress with a 5% margin of error (95% confidence level). By the end of data collection, 350 fully-answered questionnaires were included in analysis.

6. Statistical Analysis

Data were translated into a computerized database structure. The database was examined for errors using range and logical data cleaning methods, and inconsistencies were remedied. Expert statistical advice was sought. Statistical analyses were done using IBM SPSS version 23 computer software (IBM Statistical Package for Social Sciences) in association with Microsoft Excel.

The statistical significance of differences between averages for parameters of normal distribution was assessed using the Student's t-test, and for parameters deviating from normal distribution the nonparametric Mann-Whitney test and the median test were used. In the second stage, we used the Pearson's chi-squared test or Fisher's exact test to assess frequency differences of specified levels of qualitative variables, presented in nominal scales. The results of these variables were presented as proportions. We assumed the level of statistical significance at $p < 0.05$. All analyzed tests were bilateral.

Frequency distributions for selected variables were done first. To measure the strength of association between 2 categorical variables, the odds ratio (OR) was used.

Discriminant analysis is a multivariate model used to rank a set of explanatory variables according to their ability to predict diabetes distress. The model can provide a formula that helps in classifying diabetics into those with distress and those without distress.

Results

The analysis was based on a sample size of 350 type 2 diabetes patients. A half of study participants (50.6%) were between 30 and 54 years old [Table 1 - next page]. Two thirds (68%) of the sample were males. Asians constituted more than half (52.6%) of the sample, followed by Qataris (38.3%) and 9.1% for other Arabs. Most of the sampled individuals were overweight or obese (84%). About a quarter of the sample (27.1%) reported receiving injections with treatment. The HbA1c results were classified into four categories; about a quarter (24%) of subjects classified as intensive control (HbA1c <6.5%), 15.4% classified as recommended control (HbA1c 6.5-6.9%), 22.3% classified as less stringent control (HbA1c 7-7.9%) and 38.3% had poor diabetes control (HbA1c ≥8%). Only 13.7% of the study participants were diagnosed with retinopathy.

The overall prevalence of diabetes distress was 40.3% in the current sample, and expected to range between 35.2% and 45.5% in the reference population with 95% confidence [Table 2]. The prevalence rate for subscales of diabetes distress ranged between as low as 35.1% for physician distress to as high as 46.3% for regimen distress.

The high diabetes distress category (mean score of 3 and higher) was 15.1%, and moderate diabetes distress (mean score 2-2.9) was 25.1% [Table 3].

Risk of having moderate to high diabetes distress (mean score ≥3) increased in older age group (45-65 years) by 36% compared to younger age (30-44 years) [Table 4]. This observed age association was however not statistically significant. Female gender was associated with a statistically significant increase in risk of having the outcome by 62% compared to males. Only the extremely obese group (grade 2 and 3) was associated with a noticeable, but not statistically significant increase in the risk of having the outcome by 48% compared to subjects with BMI<25 Kg/m2. Compared to other Asian nationalities which had the lowest prevalence of diabetes distress (32.1%), Qatari nationality was associated with a statistically significant 2.1 times increase in risk of having distress. In addition, the other Arabic nationalities group was associated with 87% increase in risk of having distress compared to other Asians group, but the association failed to reach the level of statistical significance. Receiving injections with the therapeutic regimen for diabetes increased the risk of having distress by 41% compared to those on oral hypoglycemics, however this association was not statistically significant. Compared to the recommended diabetes control category, only the uncontrolled group was associated with a noticeable, though not statistically significant increase in the risk of having distress by 59%. The categories including duration of diabetes and being diagnosed with retinopathy had no obvious or statistically significant association with diabetes distress.

The logistic regression model for the association of gender with moderate to severe distress was not statistically significant after adjusting for the obesity [Table 5]. The accuracy of a positive prediction for distress cases was only 13.5%. Female gender was associated with 50% increase (partial OR=1.5) in risk of having moderate to severe distress compared to males after adjusting for obesity.

Eight explanatory variables were selected for inclusion in a multivariate discriminant model to predict study participants with moderate diabetes distress or higher, discriminating them from those with no distress [Table 6]. The single most important explanatory variable in predicting distressed diabetics was a Qatari/Arab nationality as opposed to that of other Asians nationalities which favored a non-distressed status. Unlike males, female gender predicted a distressed status and ranked second in its explanatory power. In the third rank was the poor control of diabetes (HbA1c ≥8%) which positively predicted a distressed individual when compared to those with HbA1c 6.5-7.9%. Receiving injections with treatment ranked fourth in the list. The fifth and sixth ranks were occupied by obesity grade 2 and 3, and older age (45-65 years). The explanatory variables with the weakest prediction were intensive diabetes control (HbA1c <6.5%) and those diagnosed with retinopathy. The discriminant model was statistically significant and able to classify individuals into distressed and non-distressed with 62% overall accuracy. The model provided a formula for calculating the discriminant score (D). If the calculated D exceeds 0.048, then we are more than 50% confident about predicting diabetes distress. The higher the D score beyond the 0.048 cut-off value, the higher probability of having diabetes distress. The formula shows that Qatari/Arab nationality or having poor control of diabetes reflected by having HbA1c ≥8% when combined with another predictor may be enough for having diabetes distress.

Table 1: Frequency distribution of the study (sample size 350) by sociodemographic and selected characteristics

Variables and values	Frequency	%
Age group (years)		
30-44	64	18.3
45-54	113	32.3
55-65	173	49.4
Gender		
Female	112	32.0
Male	238	68.0
Nationality		
Qatari	134	38.3
Other Arabs	32	9.1
Other Asian	184	52.6
BMI categories (Kg/m2)		
Acceptable (<25)	56	16.0
Overweight (25-29.9)	151	43.1
Obese Grade-1 (30-34.9)	77	22.0
Obese Grade-2 and 3 (≥35)	66	18.9
Duration of diabetes (years)-quartiles		
First, lowest quartile (≤2)	99	30.2
Average, interquartile range (2.1-10)	148	45.1
Fourth, highest quartile (>10)	81	24.7
Receiving injections		
Negative	255	72.9
Positive	95	27.1
Diabetes control (HbA1c %)		
Intensive control (<6.5%)	84	24.0
Recommended control (6.5-6.9%)	54	15.4
Less stringent control (7-7.9%)	78	22.3
Poor control (≥8%)	134	38.3
Diagnosed with retinopathy		
Negative	302	86.3
Positive	48	13.7

Table 2: Prevalence of diabetes distress and subscales

Mean score of diabetes distress and subscales	Frequency	%	95% CI
Moderate diabetes distress or higher (total DDS ≥2)	141	40.3	(35.2 to 45.5)
Moderate emotional burden or higher (mean item score ≥2)	152	43.4	(38.3 to 48.7)
Moderate physician distress or higher (mean item score ≥2)	123	35.1	(30.3 to 40.3)
Moderate regimen distress or higher (mean item score ≥2)	162	46.3	(41.1 to 51.5)
Moderate interpersonal distress or higher (mean item score ≥2)	135	38.6	(33.6 to 43.7)

Table 3: Frequency distribution of study sample by total diabetes distress mean score

Diabetes distress mean score	Frequency	%
No distress (<2)	209	59.7
Moderate distress (2-2.9)	88	25.1
High distress (≥3)	53	15.1
Total	350	100.0

Table 4: Relative frequency of having moderate diabetes distress or higher (Total DDS ≥2) by selected explanatory variables

Variables and values	Total Frequency	DDS ≥2 Frequency	%	OR	Inverse OR	95% CI OR	P
Age group (years)							
30-44	64	22	34.4				
45-54	113	47	41.6	1.36	**	(0.72 - 2.57)	0.345[NS]
55-65	173	72	41.6	1.36	**	(0.75 - 2.47)	0.312[NS]
Gender							
Male	238	87	36.6				
Female	112	54	48.2	1.62	**	(1.03 - 2.55)	0.039
Nationality							
Other Asian	184	59	32.1				
Qatar	134	67	50	2.12	**	(1.34 - 3.35)	0.001
Other Arabs	32	15	46.9	1.87	**	(0.87 - 4)	0.107[NS]
BMI (Kg/m2)							
Acceptable (<25)	56	21	37.5				
Overweight (25-29.9)	151	59	39.1	1.07	**	(0.57 - 2.01)	0.836[NS]
Obese Grade-1 (30-34.9)	77	30	39	1.06	**	(0.52 - 2.16)	0.864[NS]
Obese Grade-2 and 3 (≥35)	66	31	47	1.48	**	(0.71 - 3.05)	0.293[NS]
Duration of diabetes (years)							
First (lowest) quartile (≤2)	99	39	39.4				
Average (interquartile) (2.1−10	148	60	40.5	1.05	**	(0.62 - 1.76)	0.857[NS]
Fourth (Highest) quartile (>10)	81	33	40.7	1.06	**	(0.58 - 1.93)	0.854[NS]
Receiving injections							
Negative	255	97	38				
Positive	95	44	46.3	1.41	**	(0.87 - 2.26)	0.161[NS]
Diabetes control (HbA1c%)							
Recommended control (6.5-6.9)	54	19	35.2				
Less stringent control (7-7.9)	78	25	32.1	0.87	1.15	(0.42 - 1.81)	0.707[NS]
Intensive control (<6.5)	84	35	41.7	1.32	**	(0.65 - 2.67)	0.447[NS]
Poor control (≥8)	134	62	46.3	1.59	**	(0.83 - 3.05)	0.167[NS]
Diagnosed with retinopathy							
Negative	302	121	40.1				
Positive	48	20	41.7	1.07	**	(0.58 - 1.98)	0.834[NS]

Table 5: Multiple logistic regression model with the risk of having moderate to severe distress as the outcome

Variable	P	Adjusted OR
Female gender compared to male	0.07[NS]	1.5
Obese grade 2 and 3 compared to BMI <35 Kg/m2	0.48[NS]	1.2
Constant	≤0.001	0.562

P (Model) = 0.09[NS]
Overall classification accuracy = 59.7%
The accuracy of negative classification (mild or no distress) = 90.9%
The accuracy of positive classification (having moderate diabetes distress or higher) = 13.5%

Table 6: Discriminant model with selected explanatory variables to predict diabetics with moderate diabetes distress or higher discriminating them from those with no distress

Variable	Pooled within-groups correlations*
Qatari/Arab nationality compared to Asians	0.745
Female gender compared to male	0.463
Poor control (HbA1c ≥8%) compared to HbA1c control 6.5-7.9%	0.401
Receiving injections with treatment compared to oral medications	0.313
Obesity grade 2 and 3 compared to BMI <35 Kg/m2	0.273
Older age group (≥45 years) compared to those younger than 45 years	0.237
Intensive control (HbA1c <6.5%) compared to HbA1c control 6.5-7.9%	0.066
Being diagnosed with retinopathy	0.047

* Between discriminating variables and standardized canonical discriminant functions (variables ordered by absolute size of correlation within function)
Overall prediction accuracy = 62%
Wilks' Lambda = 0.945
P (Model) = 0.013
D = -1.699 + (0.103 x Older age group (≥45 years) compared to those younger than 45 years) + (0.808 x 1 if female gender compared to male) + (0.257 x 1 if obese grade 2 and 3 compared to BMI <35 Kg/m2) + (1.361 x 1 if Qatari/Arab nationality compared to Asians) + (0.101 x 1 if receiving injections with treatment compared to oral medications) + (0.627 x 1 if intensive control compared to HbA1c 6.5-7.9%) + (1.343 x 1 if poor control compared to HbA1c 6.5-7.9%) + (-0.213 x 1 if being diagnosed with retinopathy)
If D > 0.048, probability of having moderate diabetes distress or higher is more than being equivocal (50%)

Discussion

Our study calculated the overall prevalence rate of diabetes distress of 40.3%, a figure that requires attention and intervention. A systematic review and meta-analysis conducted on fifty-five international studies, the majority of them from United States, Canada, Australia and Europe concluded an overall prevalence of diabetes distress among people with type 2 diabetes was 36% [11].
For diabetes distress subscales, regimen distress had the highest prevalence of diabetes distress (46.3%) in the current study, followed by emotional burden (43.4%), interpersonal distress (38.6%), and physician distress had the lowest prevalence (35.1%). Family Medicine Model was introduced in PHCC two years ago. In this model of care, the patients assign themselves and their families to a specific doctor. They can also take appointments with their doctors by phone, which ensures continuity of care. This may explain why physician distress was the lowest among subscales.

Qataris had a significantly higher diabetes distress prevalence (50%), followed by other Arabs (46.9%), and Asians (32.1%), most of them were Indians. A cross sectional study performed in India showed a similar prevalence of diabetes distress of 27.9% [12]. Despite health care system differences between India and Qatar, there may be social and cultural factors explaining nationality and ethnic group differences. This ethnic group effect on diabetes distress was highlighted in two published studies, which showed that African Americans were at a higher risk for diabetes distress compared to White Americans [13], while diabetes distress scores were higher among Hispanics than African Americans [14].

It is known from previous studies that female gender is strongly associated with depression and anxiety [15]. In our study, a much lower proportion of males had diabetes distress (36.6%) compared to females (48.2%). Although females were at a higher risk, the association of gender with moderate to severe distress was not statistically significant after adjusting for the obesity. Women usually report higher levels of psychological distress than men, possibly because they are more expressive, face more stressors, and lack coping resources [16]. One published meta-analysis [11] showed a statistically significant increase in prevalence of diabetes distress among females.

Obesity grade 2 and 3 was associated with a prevalence rate of diabetes distress of 47%, compared to 39% in overweight and obesity grade 1, and 37.5% with BMI category <25 Kg/m2. Although this association was not statistically significant in the present study, a study from India reported a statistically significant positive association between diabetes distress and obesity [12]. Duration of diabetes showed no obvious or statistically significant association with diabetes distress. Despite this, diabetes distress level was shown to increase with a longer duration of diabetes as it is related to the threats of complications, functional impairment and the demanding regimens [17].
The present study showed that older age group (≥45 years) increased the risk of having distress by 36% compared to younger ages where the prevalence of distress was as low as 34.4%. This association couldn't be generalized to the population of type 2 diabetes because of failure to attain the level of statistical significance. In contrast to this study, younger ages were found to be at higher risk for diabetes distress [18]. Younger adults may show more reactions to stressors and may have less capacity to cope with stress than older adults [19].

Although not statistically significant in the present study, type 2 diabetics on only oral hypoglycemic medications had a lower prevalence of 38% for diabetes distress, compared to 46.3% for those on injections. Including injections in the management plan of type 2 diabetes was found significantly to affect diabetes distress in another recent study [12]. Fear of hypoglycemia, pain related to injections, stress associated with storing injections in a suitable place and social stigma may contribute to higher levels of distress. It was reported that in type 1 diabetes patients, the main concern linked to diabetes distress was fear of hypoglycemia, and that may explain why they have higher levels of distress compared to type 2 diabetics as management of type 1 diabetes is mainly insulin injections [20].

Although retinopathy failed to show any important association with having moderate or higher distress in the present study, other literature demonstrated that retinopathy affects vision level, family dynamics, relationships and may lead to social isolation [21]. Retinopathy may not be foreseen as a major health problem in the current study sample, probably because it is diagnosed at an early stage, since it is a routine health service for all diabetics.
Regarding association with diabetes control, the highest prevalence of diabetes distress (46.3%) was found in the poor control group, and the lowest prevalence (35.2%) among diabetics with recommended control. According to literature review there is a significant relationship between diabetes distress and poor control of HbA1c. Change in diabetes distress is associated with both short and long-term changes in glycemic control for patients with poorly controlled type 2 diabetes mellitus. Self-management education plays a major role to improve diabetes distress and leads to improvement in glycemic control [22]. A position statement of the American Diabetes Association advised for routine monitoring of diabetic people for diabetes distress, particularly at the onset of diabetes complications, or when treatment targets are not achieved (grade B) [23].

Interestingly, intensive diabetes control group had also a higher prevalence of diabetes distress (41.7%), compared to recommended control (35.2%). Diabetic patients with diabetes distress might have higher awareness of their glucose levels, and intensive control is associated with a higher probability of significant hypoglycemia. In the ACCORD study, intensive diabetes control was associated with a higher mortality rate compared to the standard treatment arm (1.41% vs. 1.14% per year), which led to termination of the study. There was no clear explanation of this result according to ACCORD data analysis [24]. American Diabetes Association recommends intensive diabetes control for only those who have short duration of diabetes and without significant hypoglycemia and/or cardiovascular disease (grade C) [9].

Study Limitations

This study was performed on type 2 diabetes patients who attended clinics at West Bay Health Center, Primary Health Care in Qatar, which is the educational center for Family Medicine Residency Program (ACGME-I accredited). Although this may affect generalizability of our study, we think this study is an important start in a field lacking such research. Multiple heath centers and secondary care would contribute to a better understanding of the size of the problem in the future.

Diabetes distress might not be properly assessable through interviews. In the future we may consider an online application to get the correlation between self-reported scores, home measurements of blood glucose levels and behavioral interventions for diabetes distress.

Conclusions

Prevalence of diabetes distress was 40.3%. Regimen distress had the highest prevalence among subscales, followed by emotional burden, interpersonal distress, and physician distress respectively. Associated factors in order of importance included; Qataris/Arabs nationality, female gender, poor control of diabetes, receiving injections with treatment, obesity grade 2 and 3, age group ≥45 years, intensive diabetes control, and being diagnosed with retinopathy.

This high prevalence of diabetes distress highlights the importance of regular screening of diabetes distress at each patient visit at primary health care, especially for those at high risk. Those who have diabetes distress need interventions and follow up. Self-management education, cognitive restructuring, goal setting and problem-solving play major roles to change the levels of diabetes distress.

Ethical Approval

We got an approval notice to conduct this study from the Independent Ethics Committee (IEC) and the Department of Clinical Research at Primary Health Care Corporation in Qatar.

Conflict of Interest

The authors declare that there is no conflict of interest regarding publication of this paper.

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