

A Study on Diabetes Distress and Its Associated Factors Among Patients with Type 2 Diabetes Mellitus Managed at Selected Primary Care Units in Colombo District, Sri Lanka

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Abstract

Introduction:

Diabetes Distress (DD) is a non-psychiatric distress component of diabetes mellitus (DM) defined as “patient concerns about disease management, support, emotional burden and access to care in DM”. DD has become a global burden associated with reduced adherence to treatment and poor glycemic control. However, little is known about DD among Sri Lankan diabetes patients.

Methods:

A descriptive cross-sectional study was conducted among patients with DM attending primary care units in Sri Lanka. Patients above 18 years with type 2 DM for more than one year were recruited. Self-administered, and interviewer-administered questionnaires were used to collect data. Diabetes Distress Scale 17 (DDS 17) was used to assess DD. Bivariate (chi-square, odds ratio) and multivariate analysis were used to assess associations.

Results:

The sample size was 389 (mean age 62.01 +/- 10.1 years) with 69.7% females. 37.5% of the population were suffering from DD. The less number of family members ($p = 0.006$) and the presence of multiple comorbidities ($p = 0.004$) were significantly associated with DD. Adequate physical exercise ($p = 0.008$), a healthy diet ($p = 0.006$), and adequate sleep ($p = 0.025$) were found to be protective against DD. Patients with DD had poor glycemic control ($p < 0.0001$).

Conclusion:

This study illustrates, that DD is a major undiagnosed problem in Sri Lankan patients with diabetes. Assessment for DD should be incorporated in routine diabetes management by developing more rapid diagnostic tools.

Keywords: Diabetes Distress, Type 2 DM, Primary care

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Introduction

Diabetes Mellitus (DM) is a metabolic disorder that is characterized by the presence of high blood glucose concentration^[1]. It has been estimated that, in 2021, 537 million people (aged 20–79) were diagnosed to have DM, with an expected rise to 643 million in 2030 and 783 million by 2045^[2]. The prevalence of DM among Sri Lankans aged 20 years and above was 10.3% (9.4–11.2%) in 2005–2006 and it is assumed that the projected prevalence will rise to 13.9% in 2030^[3]. Diabetes patients are treated with many treatment modalities yet life with DM is a challenge in many instances. Multiple medications, regular blood glucose monitoring, physician visits, restricted dietary patterns, and low quality of life. This complex lifestyle leads to

psychological distress such as frustration, anxiety, discouragement, burnout, etc^[4]. These emotional burdens and concerns related to diabetes, along with worries about the complexity and the long duration of the management plan, are collectively recognized as Diabetes Distress (DD)^[5].

DD is defined as “patient concerns about disease management, support, emotional burden, and access to care”^[6]. DD is a hidden psychological component of DM patients and it must be clearly differentiated from depression^[6]. DD can be identified by a variety of emotions ranging from unmotivation, frustration, burnout, defeat, anger, overwhelm, loneliness, denial, guilt, discouragement, and fear of hypoglycemia or complications^[4]. Most of the patients with DM don’t

express their emotional problems and DD remains undetected in many settings. Patients with DD are often perceived as “difficult patients” by healthcare workers, leading to unnecessary referrals for psychiatric evaluation or mismanagement as depression^[7]. DD itself is redundant to the compliance of affected patients which invariably deteriorates their disease status^[8]. Therefore, it is of paramount importance to identify DD as early as possible among patients with DM and treat them accordingly.

DD has become a global burden among patients with DM. Based on a recent meta-analysis the overall prevalence of DD is 36% globally^[9]. The prevalence of DD ranged from 18% to 35% in the USA^[10], 51.7% in Nigeria^[11] and 44% in South Africa^[12]. Among Asian countries, the prevalence of DD was 42.1% in China^[13], 8.9% in Thailand^[14], 28.9% in Vietnam^[15], 25% in Saudi Arabia^[16], and 19.6 in India^[17]. However, little is known about DD among Sri Lankan diabetes patients.

Specific interventions like mindfulness, progressive relaxation techniques, DM self-management education, and intervention, improving social support, problem-solving therapy, and cognitive behavioral therapy addressing DD help to improve both self-care and glycemic control^[18]. However little is known about DD and its associations in the Sri Lankan context which is a felt need to improve overall management among diabetes patients.

Considering existing needs, the present study was conducted to assess the prevalence of DD, and its associations among type 2 DM patients followed up at primary care settings in Sri Lanka. The findings of the study will help provide more comprehensive care for the affected patients and enhance their compliance and overall health-related quality of life of them.

Methodology

A descriptive cross-sectional study was conducted in selected primary care units in Colombo district from July 2020 to October 2020. Patients above 18 years diagnosed with Type 2 DM for more than one year, and followed up at the selected primary care units (DH Piliyandala, DH Thalangama, DH wethara) were recruited to the study. Patients with type 1 DM, gestational DM, hypothyroidism, major psychiatric illness, hearing defects, visual impairment, learning difficulties, patients with major diabetes-related complications defined as being on dialysis and major amputations and patients with cancer were excluded from the study. A systematic sampling method was applied. Each clinic day, the registered list of all type II diabetes patients was used as the sampling frame. The first patient was randomly selected using a dice. There onwards every consecutive patient was selected systematically until the required sample size was achieved.

A structured questionnaire was used as the study instrument. The first part was an interviewer administered questionnaire to collect socio-demographic data and associated factors. The second part was a self-administered questionnaire with components of DDS-17^[19]. The DDS – 17 contains 17 questions and each question has 6 responses which carry a score of 1(not a problem) to 6(very serious problem). Patients had to rate the degree to which an item was problematic in the last month. DD was assessed by averaging the scores of each response. The cut-off level was taken ≥ 2 for high DD. It was further

categorized into emotional burden, physician distress, regimen distress, and interpersonal distress^[19]. The DDS 17 was translated into Sinhala and Tamil Languages each by two independent translators. It was independently re-translated to English by another two translators and that was assessed for the discrepancies. These translated questionnaires were adapted to the Sri Lankan context while ensuring face validity and content validity. For this, the modified Delphi method was used with the participation of an expert panel. The expert panel consisted of two Consultant Family Physicians, two Endocrinologists, one Psychiatrist, one Physician, and one Consultant Community Physician. Consensus were achieved through the nominal group technique.

The association between DD and age, gender, duration of diabetes, education level, number of comorbidities, number of diabetic complications, health education, lifestyle interventions, smoking, sleep and treatment regimen (oral, insulin) were further assessed.

Diabetic complications and number of comorbidities were taken from patient records. Engagement in adequate physical activity was taken as 150 minutes of physical exercise per week and adequate sleeping time was taken as more than 6 hours per day.

To determine the association between DD and glycemic control, average of recent 3 consecutive fasting blood glucose values were taken from patients' records, and HbA1c was used when available.

SPSS version 20 was used for data analysis. Numerical data was presented with the use of mean and standard deviations. A chi-square test was used for categorical data. Descriptive data were presented as proportions, frequencies.

Binary logistic regression was used for the multivariate analysis to account for confounding factors. The reference value for the dependent variable was taken as a high DD level. The selection of variables for the equation was conducted at the p-value of 0.05.

Ethical approval was gained from the Ethics Review Committee of Post Graduate Institute of Medicine, University of Colombo. Permission to use the DDS17 was taken via email from Prof. Lawrence Fisher.

Results

Sociodemographic Characteristics

A total of 389 participants were included in the study from 3 different primary care units in Colombo district. A 69.7% (n = 271) of the study population were females. The mean age of the participants was 62.01 $\pm$ 10.1 years. Only 2.3% (n = 9) were unmarried and the widowed percentage was 19% (n = 74). A 93% (n = 362) were living with family while 3.4% (n = 13) were living alone and 3.6% (n = 14) were living with relatives. The majority 56.3% (n = 219) had more than 2 members in the family living with them. Majority 50.9% (n = 198) had studied up to 6 -11th grade (secondary education). The unemployed fraction was higher 50.2 (n = 195). Table 1 describes the socio-demographic factors of the study population.

Disease Characteristics

The majority 45% (n = 175) were having diabetes for less than 5 years, while only 4.4% (n = 17) had diabetes for more than 20 years. A higher proportion of the participants had 2 or more comorbidities 66.0% (n = 257). The most common associated comorbidities were hypertension 68.6% (n = 267) and

hypercholesterolemia 84.1% (n = 327). No diabetes-related macrovascular or microvascular complications were noted in 45.2% (n = 176) patients. Neuropathy was the commonest complication noted 51.7% (n = 201). A 93.83% (n = 365) were only on oral hypoglycemic agents and most were using two drugs 64.5% (n = 251). The majority of the participants 65.8% (n = 256) had an average fasting blood glucose

level of less than 130 mg/dl. Table 2 describes the disease characteristics of the study population.

Diabetes Distress Score

In this study, the percentage of those who were suffering from DD was 37.5% (N=146). When DD subscales were analyzed emotional burden was present among 43.2% (n = 168). Physician distress was minimal and was present in 4.1% (n = 16). (Table 3 & 4).

Table 1: Socio-demographic factors of the study population

	Frequency (n = 389)	Percentage
Gender		
Female	271	69.7%
Male	118	30.3%
Age category		
35 – 45	18	4.6%
46 – 55	100	25.7%
56 – 65	109	28.0%
66 – 75	123	31.6%
76 - 85	39	10.0%
Marital status		
Unmarried	9	2.3%
Married	306	78.7%
Widowed	74	19.0%
Living with		
Alone	13	3.4%
With family	362	93.0%
With relatives	14	3.6%
Number of family members		
2 or less	170	43.7%
More than 2	219	56.3%
Education		
Never had a school education	1	0.3%
Grade 1 – 5	41	10.5%
Grade 6 – 11	198	50.9%
Passed ordinary level	111	28.5%
Passed advanced level	31	8.0%
Higher education upto diploma	1	0.3%
Higher education upto degree or above	6	1.5%
Employment		
Employed	127	32.6%
Retired	67	17.2%
Unemployed	195	50.2%
Income (LKR)		
No income	28	7.2%
<15 000	60	15.4%
15 000 – 30 000	187	48.1%
30 001 – 45 000	81	20.8%
>45 000	33	

Table 3: Study participants suffering from diabetes distress

Diabetes distress	Frequency (n = 389)	Percentage
Present	146	37.5%
Absent	243	62.5%

Table 4: Distribution of diabetes distress subscale scores

Diabetes distress subscale	Present	Absent
Emotional burden	168 (43.2%)	221 (56.8%)
Physician distress	16 (4.1%)	373 (95.9%)
Regimen distress	130 (33.4%)	259 (66.6%)
Interpersonal distress	162 (41.6%)	227 (58.4%)

Table 2: Disease characteristics of the study population

Variable	Frequency (n = 389)	Percentage
Duration of diabetes (years)		
5 years or less	175	45.0%
6 -10	111	28.5%
11 – 15	53	13.6%
16 – 20	33	8.5%
>20	17	4.4%
Comorbidities		
0	34	8.7%
1	98	25.2%
2	195	50.1%
>2	62	15.9%
Type of comorbidities		
Hypertension	267	68.6%
Hypercholesterolemia	327	84.1%
Ischemic heart disease	42	10.8%
Bronchial asthma	24	6.2%
Other	1	0.3%
Number of diabetes complications		
0	176	45.2%
1	84	21.6%
2	96	24.7%
>2	33	8.5%
Type of diabetes complications		
Macrovascular diseases	49	12.6%
Nephropathy	9	2.3%
Neuropathy	201	51.7%
Retinopathy	120	30.8%
Treatment modalities for diabetes		
Oral drugs only	365	93.83%
Oral drugs and insulin	22	5.66%
Insulin only	2	0.51%
Number of oral drugs		
1	104	26.7%
2	251	64.5%
More than 2	34	8.7%
Lifestyle modifications		
Adequate physical activity	136	35.0%
Non smoker	359	92.3%
Diabetes health education	329	84.6%
Healthy diet	217	55.8%
Systolic blood pressure (mmHg)		
<120	50	12.9%
120 – 139	210	54.0%
>140	129	33.2%
Diastolic blood pressure (mmHg)		
<80	127	32.6%
80 – 89	225	57.8%
>90	37	9.5%
BMI		
Underweight	5	1.3%
Normal	187	48.1%
Overweight	149	38.3%
Obese	48	12.3%
Average FBS (mg/dL)		
<130	256	65.8%
>130	133	34.2%

Table 5: Associated factors for diabetes distress

Variable	Diabetes Distress		Odds Ratio	Statistics
	Present	Absent		
Age category				
<60 years	70 (41.7%)	98 (58.3%)	OR = 1.363	X ² = 2.156
>60 years	76 (34.4%)	145 (65.6%)	95% CI = 0.901 – 2.0601)	df = 1 p = 0.142
Gender				
Female	107 (39.5%)	164 (60.5%)	OR = 1.32	X ² = 1.451
Male	39 (33.1%)	79 (66.9%)	95% CI = 0.839 – 2.031)	df = 1 P = 0.228
Marital status				
Married	109(35.6%)	197(64.4%)	OR = 0.688	X ² = 2.234
Unmarried/ widowed/separated/ divorced	37(44.6%)	46(55.4%)	95% CI = 0.421- 1.125	df = 1 p = 0.135
Living with				
Alone	6 (46.2%)	7 (53.8%)		X ² = 3.434
With family	135 (36.8%)	227 (63.2%)		df = 4
With relative	5 (30.8%)	9 (69.2%)		p = 0.63
Number of children				
2 or less	90 (38.8%)	142 (61.2%)	OR = 1.143	X ² = 0.39
More than 2	56 (35.7%)	101 (64.3%)	95% CI = 0.751 – 1.74	df = 1 P = 0.532
Number of family members				
2 or less	86 (50.6%)	84 (49.4%)	OR = 2.71	X ² = 21.954
More than 2	60 (27.4%)	159 (72.6%)	95% CI = 1.778 – 4.14	df = 1 p = 0.0001
Level of education				
Passed O/L or above	46 (30.9%)	103 (69.1%)	OR = 0.625	X ² = 4.56
Upto grade 11 or below	100 (41.7%)	140 (58.3%)	95% CI = 0.406 – 1.12	df = 1 p = 0.056
Employment status				
Employed	51 (40%)	77 (60%)		X ² = 1.282
Retired	23 (34.3%)	44 (65.7%)		df = 2
Unemployed	72 (37.1%)	122 (62.9%)		p = 0.733
Income level (LKR)				
No income	15 (53.6%)	13 (46.4)		X ² = 17.355
<15 000	34 (56.7%)	26 (43.3%)		df = 4
15 000 – 30 000	63 (33.7%)	124 (66.3%)		p = 0.002
30 001 – 45 000	22 (27.2%)	59 (72.8%)		
>45 000	12 (36.4%)	21 (63.6%)		
Physical exercise				
Adequate	5 (3.9%)	122 (96.1%)	OR = 0.02	X ² = 98.12
Inadequate	143 (54.4%)	120 (45.6%)	95% CI = 0.0006 – 0.066	df = 1 p = 0.0003
Healthy diet				
No	119 (69.2%)	53 (30.8%)	OR = 15.8	X ² = 131.76
Yes	27 (12.4%)	190 (87.6%)	95% CI = 9.42 – 26.496	df = 1 P = 0.000
Smoking status				
No	119 (69.2%)	53 (30.8%)	OR = 0.167	X ² = 19.636
Yes	27 (75.9%)	7 (87.6%)	95% CI = 0.069 – 0.402	df = 1 p = 0.0000
Sleep				
Adequate	129 (34.9%)	241 (65.1%)	OR = 0.063	X ² = 22.98
Inadequate	17 (89.5%)	2 (10.5%)	95% CI = 0.014 – 0.277	df = 1 p = 0.0000
Diabetes health education				
No	34 (57.6%)	25 (42.4%)	OR = 2.647	X ² = 11.979
Yes	112 (33.9%)	218 (66.1%)	95% CI = 1.505 – 4.655	df = 1 p = 0.001
Average FBS (mg/dL)				
<130	32 (12.5%)	224 (87.5%)	OR = 0.024	X ² = 200.112
>130	114 (85.7%)	19 (14.3%)	95% CI = 0.013 – 0.044	df = 1 p = 0.0001
Comorbidities				
More than 1	85 (65.9%)	44 (34.1%)	OR = 6.312	X ² = 66.206
One or more	61 (23.5%)	199 (76.5%)	95% CI = 3.965 – 10.018	df = 1 p = 0.0001
Duration of diabetes				
5 or more years	107 (42.3%)	146 (57.7%)	OR = 1.823	X ² = 6.994
Less than 5 years	39 (28.7%)	97 (71.3%)	95% CI = 1.165 – 2.852	df = 1 p = 0.008
Diabetes related complications				
More than one	90 (37.2%)	152 (62.8%)	OR = 0.962	X ² = 0.032
One or none	56 (38.1%)	91 (61.9%)	95% CI = 0.63 – 1.469	df = 1 p = 0.858

Table 5: Associated factors for diabetes distress [Cont.]

Variable	Diabetes Distress		Statistics	
	Present	Absent	Odds Ratio	Chi-square
Insulin use				
No	125 (42.9%)	161 (57.1%)	OR = 0.074	X ² = 27.239
Yes	25 (23.4%)	82 (76.6%)	95% CI = 0.022 – 0.254	df = 1 p = 0.0001
Number of drugs				
More than 2	121 (42.9%)	161 (57.1%)	OR = 2.465	X ² = 12.636
One or none	25 (23.4%)	82 (76.6%)	95% CI = 1.486 – 4.089	df = 1 p = 0.0003

Table 6: Binary Logistic Regression Output for Diabetes Distress Level

	B	S.E.	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Number of family members	1.011	0.370	1	0.006	2.747	1.331	5.669
Income level	-0.079	0.406	1	0.846	0.924	0.417	2.050
Diabetic control status	-2.612	0.387	1	0.000	0.073	0.034	0.156
Presence of comorbidity	1.245	0.436	1	0.004	3.472	1.476	8.166
Disease duration	-0.471	0.445	1	0.290	0.625	0.261	1.494
Number of drugs	0.008	0.439	1	0.985	1.008	0.427	2.381
Insulin use	0.832	0.795	1	0.295	2.299	0.484	10.915
Adequate physical activity	-2.792	1.060	1	0.008	0.061	0.008	0.490
Diabetic education	0.137	0.461	1	0.766	1.147	0.465	2.833
Healthy diet	-1.065	0.387	1	0.006	0.345	0.162	0.736
smoking status	1.521	0.823	1	0.065	4.577	0.912	22.972
Sleeping time adequacy	-2.606	1.160	1	0.025	0.074	0.008	0.717

Factors Associated with DD.

There was no association between DDs and age, marital status or number of children. However there was a statistically significant association between number of family members and DD. Those who had 2 or less family members had 2.71 odds (OR = 2.71, 95% CI = 1.778 – 4.14, p=0.0001) of having DD.

The level of education, employment status had no significant association with diabetes distress.

Non-adherence to healthy dietary habits (p < 0.0001) and not receiving diabetes health education (p 0.001) were associated with high DD. Participants who had adequate physical exercise (p = 0.0003), non smokers (p < 0.0001) and adequate sleep (p < 0.0001) had less DD.

Average blood glucose level <130 mg/dl was negatively associated with high DD score. Those having average blood glucose level >130 mg/dL had 0.024 significant odds (95% CI = 0.0013 – 0.044, p=0.0001) of having high DD.

The presence of diabetes-related complications were not significantly associated with DD. Using more than 2 oral antidiabetic medicines was a significant risk factor for high DD score (p = 0.0003). Non-insulin treatment was a significant protective factor. (p = 0.0001). Table 5 summarizes the factors associated with DD.

In the multivariate analysis, number of family members (p = 0.006), diabetes control status (p < 0.0001), presence of comorbidity (p = 0.004), adequate physical exercise (p = 0.008), healthy diet (p = 0.006), and adequate sleep (0.025) were significantly associated with high DD. Table 6 summarizes binary logistic regression output for diabetes distress level.

Discussion

A total of 389 participants were included in the study In this study, the prevalence of DD was 37.5% in patients with type 2 diabetes. A recent systematic review comprising 50 studies demonstrated an overall prevalence of DD of 36% in type 2 DM which is approximately similar to this study^[9]. This may indicate the fact that eventhough socio-cultural contexts and healthcare delivery systems differ, the burden of DD is could be equally high prevalent globally. Almost one-third of the study population were affected with DD, making it a common but rather neglected entity. Therefore, identification and care of DD should be an integral part of managing patients with DM.

Emotional distress level was the most prevalent stress subscale in the current study (43.2%) which is more or less in par with data from India 34.5%^[17], Saudi Arabia 40.3%^[16] and Vietnam 45%^[15]. Emotional distress reflects the psychological response to the state of DM. This can be related to variety of factors like glycemic control, complications, and quality of life. This knowledge is of particular importance in managing DD. Physician distress was observed in only a minority of the study population (4.1%). This low rate, positively, may reflect the strong doctor-patient relationships among doctors and patients in Sri Lankan.

Due to the limited availability of HbA1c in primary care settings average fasting blood sugar value of 3 months was used as a proxy indicator. It was found that good glycemic control was associated with lower DD score, similar to other regional cross sectional studies, Thailand (n=370) (p=0.032)^[14], Vietnam (n=517) (OR=0.5, CI=0.3-0.9)^[15] and India (n=250) (OR=8.88, p<0.001)^[17]. This association can be complex and act reciprocally. Those with good glycemic control have less medical complications and QOL, which will lead to

less DD. Also, lesser DD promotes adherence to treatment and lifestyle intervention which will in turn improve glycemic control.

The presence of more than one comorbidity was associated with high DD. This was seen in the cross sectional study (n=519) (OR=2.07, CI=1.19-3.16) in Iran^[21]. The presence of multiple comorbidities results in poor QOL, polypharmacy, medical complications, social and economic problems resulting in high DD.

In our study presence of diabetes complications was not associated with higher DD. However, cross sectional studies from Saudi Arabia (n=519) (p<0.0001)^[16] and Iran (OR=3.1, CI=2.06-4.67)^[21] concluded the presence of diabetes-related medical complications to be a significant predictor of DD.

Female gender was seen as a predictor of DD in two studies from USA (OR=3.87, p<0.001)^[10] and Iran (OR=1.94, CI=1.32-2.31)^[21]. In the current study, gender was not significantly associated with DD. The reason for the observed differences can be unique sociocultural influences in Sri Lankan society and family care towards the elderly are high in our population.

A larger family size was associated with reduced level of DD. This may be result of strong family bonds in Sri Lankan culture, influencing the consideration of large family units including grandparents as a responsibility, not a burden. These findings were similar to the findings of the single center cross sectional study (n=370) in Thailand^[14] where the similar socio-cultural context of the Asian countries comes into play.

Having adequate physical activity levels was associated with low DD in the present study. A prospective cohort study in USA (n=506) (OR=0.82, p<0.05)^[10] and Iranian study (OR=3.59, CI=1.71-9.06)^[21] showed similar results depicting engagement of physical activity adequately giving rise to less DD levels.

Practicing a healthy diet was depicted as a protective factor for DD in this study. These findings agree with the findings of USA study (OR=0.77, p<0.05)^[10] where a healthy diet was associated with less DD. Additionally, following a healthy diet reflects a high level of self-care in patients. Numerous studies have found that good self-care is associated with reduced DD^[22]. This might be also indirectly affecting the findings of the current study.

Adequate sleeping time were found to be significant protective factor against DD in the current study. Furthermore, similar results were depicted in the Chinese descriptive study (n=384) (p=0.029)^[13]. The finding of the significance of sleep time in predicting DD shows the importance of taking into consideration of a patients' quality of life indicators like sleep in managing DD effectively.

This study was conducted in Colombo district which is the largest administrative district of the country. Also, we had 389 participants in the study. The sample size adds to the strength of our study.

Assessing diabetes self care using proxy indicators like diabetes health education and healthy diet was a limitation of the study. Also factors like physical exercise, diet, and smoking were not assessed using standard scales. Using the average of FBS instead of HbA1c to assess glycaemic control was a limitation of the study. The DDS 17 scale was only judgementally validated due to the time constraints.

Conclusion

This study demonstrated that a significant number of patients with type 2 DM has diabetes distress (37.5%) which could be largely undiagnosed. Therefore, assessment of DD should be incorporated into routine diabetes care. Developing rapid diagnostic tools can be helpful in this regard. Further trials are needed in interventions to control DD using the protective factors identified.

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