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Diabetes distress prevalence, determinants and its association with the treatment regimen -A cross sectional study from north-east India

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Abstract

Background: Diabetes distress (DD) in India has always been studied along with depression. There are no studies explaining the prevalence, correlation with diabetes management. This study is first of its kind from northeast India. **Methods:** The aim of this study was to estimate the prevalence of DD and determine the socio-demographic variables. Focus was also on the relationship between treatment regimen and diabetes distress. A cross sectional study was conducted in a tertiary care hospital in Guwahati, Assam. DD scale was administered on 226 patients reporting to the medicine outpatient department. Data on treatment regimen for diabetes mellitus was collected and formulated. Sample size calculation was done according to the prevailing prevalence estimates. Statistical tests like ANOVA, independent t-tests and regression analysis were used. **Results:** DD was found to have a prevalence of 43% in our study. Duration of diabetes, sedentary lifestyle, and low education were associated with higher distress levels. Patients on insulin were found to have greater distress when compared with patients on oral hypoglycaemic agents. **Conclusion:** DD was found to have higher prevalence in our study. This influences the self-care in diabetes. DD specific modalities have to be incorporated in conventional treatment of diabetes mellitus. Early screening should be foci of interest.

Key Words : Diabetes mellitus, Diabetes complications, Emotional disturbance, Hypoglycemic agents, Insulin

Introduction

Diabetes Mellitus (DM) is an important public health issue. Recently, it is estimated that the number of DM patients will go from 171 million to 366 million before 2030.¹ Diabetes is a chronic disease with high number of irreversible complications. Emotional distress associated with need for self-management in diet control, physical activity, blood glucose levels check often puts toll on the affected individual² Self-management and control

is often a challenge which poses emotional distress in the form of anger issues and irritability in the patients. This diabetes related emotional problem is termed as diabetes distress (DD).² DD first entered the literature in the year 1995 and is defined as ‘the negative emotional or affective experience resulting from the challenge of living with the demands of diabetes.’³ Distress begins with the diagnosis of diabetes. Nearly 60% of the patients with diabetes reports at least one negative emotional aspect which was problematic for their day today life³ Diabetes distress refers to a broader affective experience than major depressive disorder. It encapsulates the worries, concerns and fears among individuals struggling with a demanding chronic disease such

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as diabetes. It is not a substitute of depression.

Diabetic distress is found to have a negative association with physical activity and medication adherence.² Whereas DD management has a positive effect on glycemic control. National and international guidelines recognize the importance of annual screening for DD.⁴ DD was found to have an effect on HbA1C thus implying a role on self management of diabetes.⁵Diabetes distress can show itself in many forms and may be influenced by age, gender, culture, type of diabetes, use of insulin, number of complications and duration of illness. Common elements include powerlessness, hopelessness, fears of hypoglycaemic or medical complications, high levels of 'burnout' associated with management tasks, frustration with care providers.⁶

Previous research highlight that when diabetes distress is reduced, with the help of a psycho-education programme, then the effect on HbA1c will be mediated by self-care capability.³ Existing literature focus only on the determinants, causation, distribution and impact of depression in diabetes. But not much focus is done on DD. Prevalence of Diabetes mellitus in Assam was found to be only 5.5% when compared with mainland (around 8%) of India.⁷Literature has highlighted a very high DD prevalence of 50% across various continents.⁸But very few studies pertain to Indian scenario and literally no study is from north –east India. This study is a first of its kind to focus on the diabetes distress prevalence, its correlation with the socio-demographic profile from north east India.

Methods:

Study site and participants

Cross sectional study design with convenience sampling was used. Patients meeting American Diabetes Association criteria for type 2 diabetes mellitus seeking treatment at the outpatient clinic of Marwari maternity and multispecialty hospital, a tertiary care center in Guwahati, Assam were enrolled in the study. Data was collected over a period of three months. Adults above 18 yrs of

age with type 2 diabetes mellitus as per American Diabetes Association (Patients with Fasting Plasma Glucose level of 126 mg/dl or higher ,2hr Plasma Glucose level of 200 mg/dl or higher) were included. Patients with comorbid severe psychiatric illness such as depression, psychosis, or substance use disorders were excluded. Patients with terminal illness like chronic liver disease, kidney disease, neurological illness requiring palliative care as per World Health Organization were excluded. Patients with gestational diabetes were excluded. Patients having experienced significant life events such as divorce, financial loss, losing a job, and a close family member's death within the last 6 months were not included in the study.

Semi-structured proforma included socio-demographic details, duration of diabetes, anthropometric measures like body mass index (BMI), family type, lifestyle, duration of diabetes and biochemical profile.

DDS-17 scale to assess Diabetes Related Distress (DRD) in the study participants. DDS-17 assesses four components of DRD, which are emotional, physician-related, regimen-related, and interpersonal distress. Each of the 17 items of DDS-17 has a six-point scale for response: a mild to moderate problem is 1 or 2, a moderate to serious problem is 3 or 4, and a serious problem is 5 or 6.³ It is more reflective of the physician related stress and difficulties with self-management.² DDS-17 items were translated to Assamese, Bengali and Hindi language by bilingual persons. Written informed consent was being taken from participants, Institutional Ethics approval was taken. Consent for publication was also obtained from the participants.

We double checked the data and entered it into MS excel. We used SPSS version 20. Means and standard deviations were calculated. For continuous variables. Bivariate association between continuous variables was tested using independent t-test and ANOVA, keeping statistical significance at 0.05. Multiple linear regression and standardised linear regression were

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applied to figure out the relationship between dependent and independent variables.

RESULTS AND DISCUSSION:

A total of 226 participants were included in the study. Persons with age group 46-60 years constituted 46% of the study population. 57.96% of the population were male. A detailed socio-demographic and clinical profile is described in Table 1

Table 1a: Socio demographic and clinical parameters of the study population

Characteristics	Frequency (%)
Gender	
Female	95 (42.04)
Male	131 (57.96)
Age (years)	
<45	38 (16.82)
45-60	106 (46.90)
>60	82 (36.28)
Marital status	
Ever married	190 (84.07)
Unmarried	36 (15.93)
Education	
Primary	19 (8.41)
Secondary	43 (19.03)
Tertiary	128 (56.64)
Uneducated	34 (15.04)
Not disclosed	2 (0.88)
Family Type	
Nuclear	159 (70.35)
Joint/extended	67 (29.65)
Lifestyle	
Sedentary	74 (32.74)
Non-sedentary	152 (67.26)
BMI	
<25	121 (53.54)
25-30	79 (34.96)
>30	26 (11.50)

Table 1b: Other parameters of the study population

Characteristics	Frequency (%)
Duration of Diabetes	
<5	116 (51.33)
5-10	73 (32.30)
>10	37 (16.37)
DDS severity	
No distress <25	128 (56.64)
Moderate distress (DDS 2-2.9)	73 (32.30)

Table 1a

reports the socio-demographic profile while Table 1b reports a subset of the clinical profile for the sample. The mean age was 56.38 ± 12.25 years (28-92), and 57.96% were male. Of the entire study population, about

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16% were never married. Further, about 56% had completed their graduate studies (tertiary education), about 27% had attained secondary education or below, 15% stated they were uneducated, and a rather insignificant proportion did not disclose their education status (less than 1%). About 70% of the sample's living situation was a nuclear family type and about 67% stated having led a non-sedentary lifestyle. The Body Mass Index (BMI) of the sample averaged at 25.01, however, close to 12% had a BMI>30. Based on the total DDS score, about 32.3% of the sample was in a moderate state of distress, 11% stated high distress while a majority stated no distress (56.64%). Total distress was present in 43% of our sample. The duration of diabetes was higher than 5 years for about 48.6% of the sample. Emotional burden was found to be high in 52.65% of the sample. Physician-related distress was found for 8.4%, regimen-related distress (40.71%) and interpersonal distress (15.04%). The DD scores in different domains are illustrated in Table 2.

Table 2: Diabetes distress domain scores of the study participants

Domains	Minimum Score	Maximum Score	Mean ± S.D.
Emotional Burden	1	5.8	2.46 ± 1.20
Physician-related burden	1	15	1.39 ± 1.06
Regimen-related burden	1	5.6	2.18 ± 1.21
Interpersonal burden	1	4	1.43 ± 0.71
Total Score	1	4.76	1.92 ± 0.83

S.D. – Standard deviation

Association between the five domains of distress, including the total score, with the socio-demographic variables and clinical variables was carried out using one-way ANOVA analysis and independent t-tests [see Table 3].

Table 3: Bivariate association between sociodemographic and clinical variables and domains of Diabetes Distress Scale

variables and domains of Diabetes Distress Scale

Characteristic	Mean ± S.D.				
	Emotional Burden	Physician-related burden	Regimen-related burden	Interpersonal burden	Total Distress
Gender					
Female	2.41 ±	1.32 ± 0.050	2.21 ± 0.127	1.51 ±	1.93 ±

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	0.110			0.077	0.075
Male	2.50 ± 0.116	1.43 ± 0.116	2.15 ± 0.104	1.37 ± 0.060	1.91 ± 0.082
P-value	0.60	0.43	0.73	0.14	0.86
Age (years)					
<45	2.53 ± 1.231	1.26 ± 0.557	2.15 ± 1.320	1.31 ± 0.614	1.91 ± 0.887
45-60	2.37 ± 1.202	1.45 ± 1.456	2.06 ± 1.085	1.39 ± 0.706	1.85 ± 0.824
>60	2.55 ± 1.212	1.36 ± 0.510	2.33 ± 1.314	1.52 ± 0.771	2.02 ± 0.824
P-value	0.54	0.59	0.32	0.26	0.37
Marital status					
Ever married	2.47 ± 0.087	1.41 ± 0.083	2.20 ± 0.087	1.42 ± 0.052	1.93 ± 0.061
Unmarried	2.40 ± 0.209	1.27 ± 0.064	2.05 ± 0.205	1.45 ± 0.120	1.86 ± 0.134
P-value	0.74	0.48	0.50	0.86	0.62
Education					
Primary	2.97 ± 1.326	1.39 ± 0.636	2.67 ± 1.343	1.55 ± 0.752	2.26 ± 0.922
Secondary	2.52 ± 1.162	1.34 ± 0.622	2.24 ± 1.232	1.42 ± 0.567	1.96 ± 0.784
Tertiary	2.38 ± 1.197	1.41 ± 1.330	2.06 ± 1.163	1.31 ± 0.658	1.84 ± 0.817
Uneducated	2.37 ± 1.220	1.36 ± 0.477	2.21 ± 1.287	1.78 ± 0.940	1.99 ± 0.902
P-value	0.23	0.98	0.22	0.00	0.18
Family Type					
Nuclear	2.52 ± 0.096	1.43 ± 0.102	2.20 ± 0.101	1.46 ± 0.059	1.95 ± 0.068
Joint/extended	2.33 ± 0.154	1.30 ± 0.060	2.14 ± 0.144	1.39 ± 0.086	1.87 ± 0.100
P-value	0.28	0.40	0.72	0.46	0.47
Lifestyle					
Sedentary	2.69 ± 0.164	1.56 ± 0.195	2.44 ± 0.168	1.55 ± 0.097	2.11 ± 0.116
Non-sedentary	2.35 ± 0.087	1.30 ± 0.043	2.05 ± 0.086	1.37 ± 0.052	1.83 ± 0.058
P-value	0.04	0.08	0.02	0.07	0.02
Duration of Diabetes					
<5	2.12 ± 1.035	1.19 ± 0.435	1.79 ± 0.88	1.26 ± 0.551	1.64 ± 0.649
5-10	2.86 ± 1.346	1.64 ± 1.715	2.58 ± 1.347	1.63 ± 0.857	2.23 ± 0.933
>10	2.75 ±	1.50 ± 0.586	2.58 ± 1.439	1.57 ±	2.20 ±

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	1.140			0.761	0.864
P-value	0.00	0.01	0.00	0.00	0.00
BMI					
<25	2.42 ± 1.236	1.36 ± 0.588	2.12 ± 1.221	1.44 ± 0.725	1.91 ± 0.854
25-30	2.49 ± 1.118	1.44 ± 1.612	2.24 ± 1.170	1.39 ± 0.643	1.93 ± 0.756
>30	2.54 ± 1.378	1.32 ± 0.651	2.23 ± 1.338	1.48 ± 0.898	1.97 ± 0.991
P-value	0.86	0.82	0.76	0.83	0.93

*Statistically significant. SD – Standard deviation; BMI – Body mass index

Using a critical value of $\alpha=0.05$, we found that there weren't any significant differences across the 5 domains of distress when comparing across participants' gender, age, marital status, family type and BMI. High interpersonal distress was found for participants who were either uneducated or had primary education relative to participants who were graduates. An implication of this result is that education may be an important factor affecting interpersonal stress.

Interesting differences arise when comparing the five types of distress across lifestyle and across the 3 categories for duration of diabetes. All types of distress are statistically significant and higher for patients with 5-10 years of diabetic history and in patients with more than 10 years of duration of diabetes. Furthermore, for patients who have a sedentary lifestyle, all types of distress except physician-related burden appear to be higher (statistically significant).

Table 4

provides results from 3 sets of multiple regressions of independent variables on the dependent variable (five types of distress: emotional, physician-related, regimen-related, interpersonal, and total distress). These 5 variables are denoted in the topmost row of Table 4 as Specification (1)-(5). Set 1, i.e., the top panel of Table 4 presents a standardized linear regression of the Treatment variable on the various types of distress. Treatment is a dummy variable defined as 1 if the patient is on oral hypoglycemic drugs while it is 0 if the patient also prescribed insulin in addition to oral drugs. The coefficient identifies a causal effect of oral hypoglycemic drugs on distress relative to the patients who receive oral drugs +Insulin. The top panel shows that all 5 types of distress are statistically significantly lower ($p\text{-value}<0.05$) for patients who only receive the OAD, but the effect is the strongest for regimen-related distress and total distress (1.23 standard deviations lower for Oral hypoglycemic drugs relative to Oral hypoglycemic drugs +Insulin).

Table 4: Standardized multiple regression analysis of distress on characteristics

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	(1)	(2)	(3)	(4)	(5)
Variables	Emotional Burden	Physician-related burden	Regimen-related burden	Interpersonal burden	Total Distress
Set 1					
Treatment	-1.081***	-0.414***	-1.238***	-0.608**	-1.232***
	(0.186)	(0.142)	(0.198)	(0.236)	(0.200)
Constant	0.933***	0.358***	1.068***	0.525**	1.063***
	(0.174)	(0.121)	(0.188)	(0.226)	(0.190)
Observations	226	226	226	226	226
R-squared	0.139	0.020	0.182	0.044	0.180
Set2					
Treatment	-0.851***	-0.289	-0.999***	-0.401	-0.971***
	(0.216)	(0.182)	(0.238)	(0.271)	(0.234)
Age	-0.112	-0.0642	-0.0805	0.0315	-0.0939
	(0.0768)	(0.0489)	(0.0788)	(0.0801)	(0.0760)
Gender	-0.0620	-0.0593	-0.0116	0.0863	-0.0191
	(0.0591)	(0.0552)	(0.0630)	(0.0655)	(0.0592)
Education	-0.0890	0.0155	-0.0638	0.0791	-0.0524
	(0.0595)	(0.0357)	(0.0602)	(0.0718)	(0.0589)
BMI	0.00620	0.00140	0.0240	0.000998	0.000579
	(0.0674)	(0.0533)	(0.0656)	(0.0767)	(0.0698)
Duration of DM	0.104	0.110	0.150*	0.0938	0.147**
	(0.0743)	(0.0668)	(0.0864)	(0.0812)	(0.0740)

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Glycemic Control	-0.272***	-0.106***	-0.148***	-0.191***	-0.233***
	(0.0529)	(0.0383)	(0.0535)	(0.0501)	(0.0489)
Constant	0.732***	0.249*	0.862***	0.344	0.836***
	(0.198)	(0.139)	(0.214)	(0.250)	(0.216)
Observations	224	224	224	224	224
R-squared	0.237	0.048	0.225	0.111	0.258
Set3					
Treatment	-0.450	-0.334**	-0.701**	-0.236	-0.632**
	(0.301)	(0.167)	(0.341)	(0.284)	(0.297)
Age	-0.0671	0.00562	0.00821	0.0439	-0.0203
	(0.0871)	(0.0442)	(0.103)	(0.0798)	(0.0855)
Gender	-0.0332	-0.0613	0.0545	0.0616	0.00450
	(0.0678)	(0.0379)	(0.0799)	(0.0654)	(0.0666)
Education	-0.120*	-0.0221	-0.0617	0.00128	-0.0830
	(0.0612)	(0.0365)	(0.0752)	(0.0707)	(0.0594)
BMI	0.0564	-0.0368	0.126	0.0471	0.0754
	(0.0793)	(0.0473)	(0.0792)	(0.0775)	(0.0811)
Duration of DM	0.107	0.0237	0.156	0.105	0.138*
	(0.0818)	(0.0473)	(0.107)	(0.0743)	(0.0799)
Glycemic Control	-0.0939	0.0153	0.00180	-0.0145	-0.0392
	(0.0636)	(0.0331)	(0.0728)	(0.0543)	(0.0600)
HbA1C	0.429***	0.199***	0.330***	0.348***	0.437***
	(0.129)	(0.0624)	(0.117)	(0.109)	(0.122)

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Constant	0.311	0.203	0.553*	0.0752	0.464*
	(0.269)	(0.150)	(0.305)	(0.248)	(0.265)
Observations	143	143	143	143	143
R-squared	0.399	0.295	0.318	0.270	0.434

Dependent variables are mentioned in the top row. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Set 2,
 i.e., the middle panel of Table 4 presents results from a standardized linear regression of the Treatment variable and other characteristics on the various types of distress. Independent variables in set 2 include Age, Gender, Education, BMI, Duration of DM and Glycemic control. Glycemic control is divided into 2 categories: good control if fasting blood sugar (FBS) is below 130 and poor control, otherwise.¹ Results reveal that of all the patient characteristics, glycemic control is the most important and the only variable that is significantly related to the distress other than the Treatment variable, i.e. Oral hypoglycemic drugs. Across all the 5 specifications, good glycemic control has a causal relationship with distress in that if a patient has good glycemic control, they are less likely to experience all kinds of distress (p-value<0.05). This effect is the strongest for emotional distress followed by total, interpersonal, regimen-related, and finally physician-related distress. Results for the treatment (OAD) are still negative and significant but only for emotional, regimen-related, and total distress. Duration of Diabetes only affects total distress such that having a longer history of diabetes is more likely to increase total distress by 0.14 standard

deviations (p-value<0.05).

Set 3,
 i.e., the bottom panel of Table 4 presents results from a standardized linear regression of the Treatment variable and all other characteristics on the various types of distress including HbA1C. Independent variables in set 3 include Age, Gender, Education, BMI, Duration of DM and Glycemic control and HbA1C.² Results for the treatment (OAD) are negative and significant but only for physician-related, regimen-related, and total distress. Duration of DM only affects total distress, as before, such that having a longer history of diabetes is more likely to increase total distress by 0.13 standard deviations (p-value<0.05). This value is slightly smaller than the effect observed in Set 2.

Interestingly, when the HbA1C variable is added to the set of independent variables, glycemic control loses its ability to predict distress. HbA1C turns out to be an important predictor variable that is significantly related to the distress. Across all the 5 specifications, if a patient's HbA1C concentration increases, it leads to an increase in distress (p-value<0.05). This effect is the strongest for total distress,

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followed by emotional, interpersonal, regimen-related, and finally physician-related distress. Overall, our data highlights the importance of several variables in predicting and explaining the distress levels. To summarize, there is a strong relationship between a sedentary lifestyle and distress severity. Further, poor glycemic control or high HbA1C concentration can lead to larger distress relative to patients who either have good glycemic control or low HbA1C concentration. Finally, patients who are prescribed OAD and insulin tend to have higher amounts of distress relative to patients who are only prescribed OAD.

DISCUSSION:

The impaired psychosocial functioning which DD brings is mainly due to the fact that the individual considers himself to be a victim of a chronic, incurable, non-healing disease. He refrains from diet, physical exercise and treatment adherence which complicates the picture further.² Limited studies are from India. Previous research has highlighted a prevalence of 18% of DD from north India⁹, 24.8% from east India¹⁰, 41% from coastal south India.¹¹ There are no studies from north-east part of India. Though the prevalence of Diabetes mellitus in north eastern part is a bit low (8-12%)¹² when compared with the mainland, in this study we were able to get around 43% (32%-moderate, 11%-high) Emotional burden was found to be higher when compared to previous studies where regimen related distress was high.²

Uneducated or patients with only primary education was found to have high distress. This might be due to the apprehension regarding the illness, difficulty in understanding the treatment aspects. Also duration of diabetes had a significant impact on distress score. The

longer the duration, the more distress. This might be due to the complications, realization of irreversible nature of the illness. This finding is in accordance with the previous literature.³

HbA1c reports were not available for the entire study sample, (n=145) the understanding of Diabetes Distress on glycemic control could be limited. However, across all the 5 specifications, if a patient's HbA1C concentration increased, it led to an increase in distress. This effect is the strongest for total distress, followed by emotional, interpersonal, regimen-related, and finally physician-related distress.

In the present study, the sample size for patients taking insulin (n=31) were comparatively lower, but the data clearly showed increased distress amongst subjects taking Insulin when compared to subjects on Oral hypoglycemic drugs. Insulin distress is a major contributor of DD.¹³ Greater distress due to insulin could be largely explained by greater disease severity and self-care burdens.¹⁴ Insulin injection, problematic hypoglycaemia, and a sense of personal failure and low self-efficacy could be other sources of distress for insulin users.

Distress was found to be lower for patient taking oral hypoglycemic drugs when compared to Insulin. This might be due to the excessive burden associated with self glucose level monitoring with home strips, being titled as insulin user. Many patients consider insulin to be a reminder of the chronicity of diabetes, also as an admonition of self's unresponsiveness to oral regimen. This kindles self-pity, low esteem. This is a very pivotal point in our study as our study is the first to figure out the relationship between treatment regimen and the distress. Previous literature has figured out that patients with high diabetes distress tends to have a poor

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adherence.¹¹

CONCLUSION:

Diabetes Distress rates are very high in our population with type 2 diabetes mellitus. Diabetes Distress is associated within increased duration of diabetes, poor glycemic control. The alliance between diabetes distress and self management needs extensive probing. Diagnosis of DD should be made in routine diabetes care, and the risk factors for DD need to be identified. DD is amenable to psychological interventions. Hence, there is a need to address DD to improve self-management of diabetes. Reducing DD has the potential to improve overall clinical outcomes in patients with diabetes mellitus.

LIMITATIONS:

Unavailability of HbA1c reports of the entire study sample limits our understanding of the effect of glycemic control on Diabetes Distress. Cross sectional nature of the study limits its generalisability. Multi-centric studies in the future might enlighten us on unmapped associations

DECLARATIONS

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CONFLICTS OF INTEREST

Authors declare there are no conflicts of interest.

AUTHOR CONTRIBUTIONS

DA conceived and designed the study, AS conducted research, provided research materials, and collected and organized data. VVP analyzed and interpreted data. VVP and DA wrote initial and final draft of article and provided logistic support. All authors have critically reviewed and approved the final

draft and are responsible for the content and similarity index of the manuscript.

CONSENT FOR PUBLICATION

Consent for publication was obtained from all participants.

References:

- 1) Wild, S., Roglic, G., Green, A., Richard, S., & King, H. Estimates for the year 2000 and projections for 2030, *World Health*, 2004;27(5), 1047–1053
- 2) Patra S, Patro BK, Padhy SK, Mantri J. Prevalence of diabetes distress and its relationship with self-management in patients with type 2 diabetes mellitus. *Ind Psychiatry J* 2021;30:234-9.
- 3) Skinner TC, Joensen L, et al. Twenty-five years of diabetes distress research. *Diabetic Medicine*. 2020;37(3):393-400
- 4) Fisher L, Gonzalez JS, et al. The confusing tale of depression and distress in patients with diabetes: a call for greater clarity and precision. *Diabetic Medicine*. 2014;31(7):764-72.
- 5) Schmidt CB, van Loon BJP, Vergouwen ACM, Snoek FJ, Honig A. Systematic review and meta-analysis of psychological interventions in people with diabetes and elevated diabetes-distress. *Diabet Med*. 2018 Jun 13. doi: 10.1111/dme.13709.
- 6) Fisher L, Polonsky WH, Hessler D. Addressing diabetes distress in clinical care: a practical guide. *Diabet Med*. 2019 Jul;36(7):803-812
- 7) Anjana RM et al. *Lancet Diabetes Endocrinol*. 2017 Aug;5(8):585-596.

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- 8) Dennick K, Sturt J, Speight J. What is diabetes distress and how can we measure it? A narrative review and conceptual model. *J Diabetes Complications* 2017;31:898-911
- 9) Gahlan D, Rajput R, Gehlawat P, Gupta R. Prevalence and determinants of diabetes distress in patients of diabetes mellitus in a tertiary care centre. *Diabetes Metab Syndr.* 2018 May;12(3):333-336.
- 10) Roy M, Sengupta N, Sahana PK, Das C, Talukdar P, Baidya A, et al. Type 2 diabetes and influence of diabetes specific distress on depression. *Diabetes Res Clin Pract* 2018;143:194-8
- 11) Kumar N, Unnikrishnan B, Thapar R, Mithra P, Kulkarni V, Holla R, et al. Distress and Its effect on adherence to antidiabetic medications among type 2 diabetes patients in coastal South India. *J Nat Sci Biol Med* 2017;8:216-20.
- 12) Anjana RM et al; ICMR-INDIAB Collaborative Study Group. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR-INDIAB population-based cross-sectional study. *Lancet Diabetes Endocrinol.* 2017 Aug;5(8):585-596
- 13) Kalra S, Balhara YP. Insulin distress. *US Endocrinol.* 2018;14(1):27
- 14) Delahanty LM, Grant RW, Wittenberg E, Bosch JL, Wexler DJ, Cagliero E, Meigs JB. Association of diabetes-related emotional distress with diabetes treatment in primary care patients with Type 2 diabetes. *Diabet Med.* 2007 Jan;24(1):48-54
- 15) Hunt LM, Valenzuela MA, Pugh JA. NIDDM patients' fears and hopes about insulin therapy: the basis of patient reluctance. *Diabetes Care* 1997;20:292-298.
- 16) Polonsky WH, Fisher L, Guzman S, Villa-Caballero L, Edelman SV. Psychological insulin resistance in patients with type 2 diabetes. *Diabetes Care* 2005;28:2543-2545.
- 17) Davis RE, Morrissey M, Peters JR, Wittrup-Jensen K, Kennedy-Martin T, Currie CJ. Impact of hypoglycaemia on quality of life and productivity in type 1 and type 2 diabetes. *Curr Med Res Opin* 2005; 21: 1477-1483.