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PREDICTORS OF DIABETES DISTRESS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Diabetes distress is a condition distinct from depression that is related to diabetes outcomes. This study intends to identify the predicting risk factors of diabetes distress in Bangladeshi type 2 diabetes mellitus patients. A cross sectional study was conducted from January to June, 2012 in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka. Data were collected through interview and reviewing documents. Among 165 respondents, the proportion of diabetes distress was 48.5% (n=80) which include 22.4% (n=37) high distress and 26.1% (n=43) moderate distress. Glycemic status measured by HbA1c was the best predictor of diabetes distress [Adjusted odds ratio (AOR) 1.56; 95% Confidence Interval (CI) 1.16 to 2.10]. Insulin users were five times more likely to develop distress (OR, 5.05 with 95% CI, 1.20 to 21.19) than users of oral anti-diabetic agents. Other predictors of diabetes distress were Duration of DM [Adjusted odds ratio (AOR) 1.27; 95% Confidence Interval (CI) 1.06 to 1.52], Diabetic complications [Adjusted odds ratio (AOR) 3.92; 95% Confidence Interval (CI) 1.09 to 14.19], Average monthly family income [Adjusted odds ratio (AOR) 1.00; 95% Confidence Interval (CI) 1.00 to 1.00]. HbA1c, Treatment modalities, Duration of DM, Diabetic complications and Average monthly family income appeared to be significant predicting factors of diabetes distress among the type 2 diabetes mellitus patients. This should be taken into consideration for effective management of patient.

Key words: Diabetes Distress, Type 2 Diabetes Mellitus, Predictors, Glycaemic status, Treatment modalities of DM

INTRODUCTION

Diabetes mellitus (DM) is one of the most common non-communicable diseases globally.[1] It has been predicted that approximately 366 million people having DM worldwide in 2011 and this is expected to increase to 552 million of the adult population by 2030.[1] More than 80% of diabetes deaths occur in low and middle income countries.[2] World Health Organization (WHO) projects that diabetes will be the 7th leading cause of death in 2030.[2] Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of type 2 diabetes mellitus (T2DM).[2]

Epidemiological evidences suggest that the incidence of diabetes is increasing worldwide. It is now believed that

low and middle-income countries will face the greatest burden of diabetes. The management of diabetes mellitus and the management and prevention of the complications are important challenges for the present time. There are ample evidences from applied clinical research that morbidity and mortality risks associated with diabetes are preventable.[3]

Diabetes distress (DD) is defined as patient concerns about disease management, support, emotional burden, and access to care, is an important condition distinct from depression. DD is a part of having diabetes and is non-psychiatric distress. Addressing DD improves both self-care and glycemic control. Many people experience considerable distress about having diabetes and the amount of hands-on management that diabetes requires. This often includes frustration with the ongoing obligations of diet, physical activity, blood glucose monitoring and taking medicines. DD is a condition distinct from depression that is related to diabetes outcomes.[5]

In the May/June 2008 issue of the *Annals of Family Medicine*, Dr. Fisher and his colleagues reported that they have created a brief diabetes distress screening instrument that can be used in a clinical setting. This scale builds upon a 17-item Diabetes Distress Scale (DDS17) that had been developed by Drs. William Polonsky and Fisher in 2007. To create the briefer version of the scale, Dr. Fisher and his team assessed 496 community-based patients with T2DM utilizing the DDS17. From this research, they created a 2-item diabetes distress screening instrument (DDS2) that asks patients to rate on 6-pointscale. If a patient answers affirmatively to the DDS2 questions, the DDS17 can be administered to help define the content of the distress and to direct intervention. For example, clinicians and patients can identify areas where interventions might be helpful: emotional burden (feeling overwhelmed by diabetes), physician-related distress (worries about access, trust, and care), regimen related distress (concerns about diet, physical activity, medications), and interpersonal distress not receiving understanding and appropriate support from others). Even though clinical depression remains a prevalent condition among patients with diabetes, Dr. Fisher and his colleagues continue to show that most patients with diabetes are not clinically depressed but, instead, are distressed about their diabetes and its management. They believe that depression is related to, but distinct from, diabetes distress. Fortunately for both clinicians and patients, there are new tools that can be used to help diagnose diabetes distress and suggest appropriate interventions. In those without distress initially, little is known about what indicators place patients at risk for subsequent distress over time. Although many clinicians now regularly screen for clinical depression in their patients with diabetes, until recently there was no easy way to screen patients for diabetes distress and identify areas of diabetes management where intervention would be beneficial.[6]

At a single point in time, the prevalence of DD may range from 18% to 35%. A longitudinal study showed that, over a period of 18 months, 48% of participants experienced high levels of diabetes distress.[7]

T2DM constitutes about 85 to 95% of all diabetes. The magnitude of a DM in Bangladesh is increasing.[3]

Many studies regarding DM and its prevalence and risk factors have been done in Bangladesh [10, 11, 23] but studies related to DD in Bangladesh so far not revealed. Those studies together with the studies carried out in different parts of the world [8, 14- 17, 19- 21] were reviewed for the purpose of the study.

This study has been planned to know the magnitude of the DD in T2DM among the patients of countries largest tertiary level hospital BIRDEM. Findings of this study will help in the research field and also the planner to develop appropriate policy for prevention, control and rehabilitation of T2DM.

METHODS

A cross sectional study was conducted in a specialized hospital of Dhaka city to find out predictors of diabetes distress among type 2 diabetic patients. The period of study was a total duration of six months from January 2012 to June 2012. Samples were taken purposively. Data were collected through interview and document review. The study was conducted at BIRDEM Hospital, Dhaka. This center is selected because patients with diabetes come to this hospital from different locations, clinics, peripheral diabetic centers and from different corners of Bangladesh for proper treatment and better management. Cases were adult T2DM patients who were willing to participate in the study had HbA1c test report done within 3 months of the interview and had record height and weight in their diabetic guide books. Severely ill and mentally retarded patients were excluded from this study. Assuming prevalence of diabetes distress 18%[7], 95% confidence level with 5% absolute precision, 80% power estimated sample size was 226. Some samples were rejected due to missing of important information in data sheet. Among those

samples finally 165 samples were selected for statistical analysis

DDS English version was translated into Bangla and was used to measure DD. DDS-17[4] is a valid tool (α=0.93) [5] for measuring diabetes distress which is used by many other researchers in their studies.

At first DDS2 was used for screening purpose. If a patient answered affirmatively to the DDS2 questions, the DDS17 can be administered to help define the content of the distress and to direct intervention. A patient's diabetes distress was measured by DDS self-report scale with subscales reflecting four domains including Emotional Burden (5 items), Physician Distress (4 items), Regimen Distress (5 items) and Interpersonal Distress (3 items) considering a mean item score as a level of distress worthy of clinical attention. Cut-off point was selected. [7] e.g.-Little / No Distress :< 2, Moderate Distress: 2-2.9, High Distress: ≥3. Each questionnaire took approximately 30 to 35 minutes to fill up. Before data collection objective of the study was informed to the respondent and requested to participate in the study. Informed written consent was taken from the participants of the study.

Permission was taken from the regarding authority. The privacy and confidentiality was strictly maintained during data collection. An interview schedule was prepared and used for data collection. The instrument was prepared keeping in mind the research question, objectives and variables considered in the study. The instrument was pre-tested among 10 patients in Bangladesh Institute of Health Sciences (BIHS), Dhaka for clarity, accuracy, and un-ambiguity and to find out the face validity of the questions. Minor modifications were incorporated in the interview schedule. Final research instrument was developed to use in data collection. The research instrument contains mainly structured questions with few unstructured questions.

At the end of the day of data collection period, individual interview schedule was edited through checking and rechecking, to see whether it was filled completely and consistently. Then the data was entered into computer, with the help of software SPSS windows program version 20. After frequency run, data were cleaned and frequency distributions were checked for normal distribution. Respondents practicing religion other than Islam were recorded as non-Muslim, respondents who residing in other than urban recorded as sub urban those who were single at the time of interview (including widow/widower and divorcee) were recorded as single, educational status was re-coded into two groups as up to primary and secondary & above, occupational status was re-coded as unemployed and employed group, Moderate and high distress were re-coded as a distress for convenience of calculation. BMI is categorized according to WHO guideline.[25] One respondent having BMI <18.5 (18.25) was considered within normal range for the convenience of statistical analysis. To determine glycemic status, HbA_{1c} level was categorized as HbA_{1c} level < 7% as good glycemic control, 7 to 8 fair glycemic control and > 8% considered as poor glycemic control. After thorough cleaning and editing of the data, an analysis plan was developed keeping in view of the objective of the study.

Statistical analysis:

Descriptive statistics was done for frequencies and percentages. Univariate analysis was done for significant risk factors using Independent-Samples t-test, One-Way ANOVA for diabetes distress score and chi-square test for level of diabetes distress. Multivariate stepwise Logistic Regression was done to find out predictors of diabetes distress among all significant risk factors. All the tests were two tailed and p<0.05 was considered to be statistically significant.

RESULTS

Among 165 respondents, 50.9% were female. Their mean age was 52.47 years (SD 9.35 years). Most of them were from urban area (63.6%) and married (93.9%). There was a statistically significant difference at the p<0.05 level in diabetes distress score for the four age groups (p<0.001). There was no significant difference in scores for Muslim and Non-Muslim. There was no significant difference in scores for Married and Single. There was a statistically significant difference at the p <0.05 level in diabetes distress score for educational status (p<0.05). There was a statistically significant difference at the p <0.05 level in diabetes distress score for occupational groups (p<0.05). There was no significant difference in scores for Nuclear family and Non-nuclear family. There were more distress on ≥60 years age group (2.62±0.00), sub-urban group (2.36±0.81), up to primary education group (2.32±0.74), unemployed occupation group (2.35±0.73), >5 members family size group (2.32±0.73), <15000 taka average monthly family income group (2.38±0.66). [Table 1]

There was statistically significant difference at the p <0.05 level in diabetes distress score for duration of DM (p<0.001), Treatment modalities (p<0.001), diabetic

complications (p<0.001), HbA1c (p<0.001), BMI (p<0.001), smoking status (p<0.05). There were more distress on >10 years duration of DM group (2.81±0.61), treatment modalities (oral+ insulin) group (2.72±0.66), having diabetic complication group (2.63±0.64), poorly controlled HbA1c group (2.56±0.62), ever smoker group (2.39±0.80), obese group (3.11±0.47). [Table 2]

The influence of age on level of diabetes distress was statistically significant (p<0.001). The influence of occupation on level of diabetes distress was statistically significant (p<0.05). The influence of family size on level of diabetes distress was statistically significant (p<0.05). There were highest percentages of distressed symptoms among ≥60 year's group (72.5%), unemployed occupation group (58.1%), family size >5 members group (59.0%). [Table 3]

Table 1: Total Distress score and sociodemographic characteristics

Characteristics		No. (%)	Total Distress score Mean (SD)	P
Age (in years)	<40	13(7.9)	1.86(0.50)	<0.001*
	40-49	47(28.5)	1.81(0.70)	
	50-59	65(39.4)	2.21(0.70)	
	≥60	40(24.2)	2.62(0.00)	
Sex	Male	81(49.1)	2.07(0.71)	ns
	Female	84(50.9)	2.25(0.79)	
Residence	Sub-urban	60(36.4)	2.36(0.81)	<0.05*
	Urban	105(63.6)	2.05(0.70)	
Religion	Muslim	159(96.4)	2.19(0.75)	<0.05*
	Non-Muslim	6(3.6)	1.47(0.44)	
Marital status	Married	155(93.9)	2.15(0.74)	ns
	Single	10(6.0)	2.37(0.98)	
Educational status	Up to primary	82(49.7)	2.32(0.74)	<0.05*
	Secondary & above	83(50.3)	2.02(0.74)	
Main occupation	Unemployed	86(52.1)	2.35(0.73)	<0.05*
	Employed	79(47.9)	1.96(0.73)	
Type of family	Nuclear	148(89.7)	2.16(0.73)	ns
	Non-nuclear	17(10.3)	2.24(0.93)	
Family size (in number)	0 to 5	104(63.0)	2.07(0.75)	<0.05*
	>5	61(37.0)	2.32(0.73)	
Average monthly family income (in taka)	<15000	56(33.9)	2.38(0.66)	<0.05*
	15000-30000	76(46.1)	2.17(0.78)	
	31000-45000	19(11.5)	1.85(0.74)	
	>45000	14(8.5)	1.75(0.71)	

*Significant at 0.05 level.

Table 2: Total Distress score and clinical characteristics

Characteristics		No. (%)	Total Distress score Mean (SD)	P
Duration of DM (in years)	0-10	112(67.9)	1.86(0.62)	<0.001*
	>10	53(32.1)	2.81(0.60)	
Type of diabetic management	Non pharmacological	4(2.4)	1.97(0.83)	ns
	Pharmacological	161(97.6)	2.17(0.75)	
Treatment modalities (Type of Anti-diabetic agents)*	Oral	91(56.5)	1.87(0.63)	<0.001*
	Insulin	45(28.0)	2.47(0.75)	
	Oral + Insulin	25(15.5)	2.72(0.66)	
Diabetic complications	Absent	83(50.3)	1.71(0.56)	<0.001*
	Present	82(49.7)	2.63(0.64)	
HbA1c (%)	Good <7	65(39.4)	1.71(0.56)	<0.001*
	Fair 7-8	29(17.6)	2.21(0.88)	
	Poor >8	71(43.0)	2.56(0.62)	
Smoking status	Never smoker	100(60.6)	2.02(0.69)	<0.05*
	Ever smoker	65(39.4)	2.39(0.80)	
Body Mass Index (BMI)	Normal	76(46.1)	2.28(0.80)	<0.001*
	Overweight	83(50.3)	2.00(0.66)	
	Obese	6(3.6)	3.11(0.47)	

*Significant at 0.05 level.

Table 3: Sociodemographic characteristics of the respondents and level of diabetes distress

Characteristics	Level of diabetes distress		Total n(%)	P
	Little/No n (%)	Distress n(%)		
Age (in year)				
<40	11(84.6)	2(15.4)	13(7.9)	<0.001*
40-49	34(72.3)	13(27.7)	47(28.5)	
50-59	29(44.6)	36(55.4)	65(39.4)	
≥60	11(27.5)	29(72.5)	40(24.2)	
Sex				
Male	47(58.0)	34(42.0)	81(49.1)	ns
Female	38(45.2)	46(54.8)	84(50.9)	
Residence				
Sub-urban	28(46.7)	32(53.3)	60(36.4)	ns
Urban	57(54.3)	48(45.7)	105(63.6)	
Religion				

Muslim	80(50.3)	79(49.7)	159(96.4)	ns
Non- Muslim	5(83.3)	1(16.7)	6(3.6)	
Marital status				
Married	81(52.3)	74(47.7)	155(93.9)	ns
Single	4(40.0)	6(60.0)	10(6.1)	
Educational status				
Up to primary	36(43.9)	46(56.1)	82(49.7)	ns
Secondary & above	49(59.0)	34(41.0)	83(50.3)	
Main occupation				
Unemployed	36(41.9)	50(58.1)	86(52.1)	<0.05*
Employed	49(62.0)	30(38.0)	79(47.9)	
Types of Family				
Nuclear	77(52.0)	71(48.0)	148(89.7)	ns
Non-nuclear	8(47.1)	9(52.9)	17(10.3)	
Family size (in number)				
0-5	60(57.7)	44(42.3)	104(63.0)	<0.05*
>5	25(41.0)	36(59.0)	61(37.0)	
Average monthly family income (in taka)				
<15000	22(39.3)	34(60.7)	56(33.9)	ns
15000-30000	40(52.6)	36(47.4)	76(46.1)	
31000-45000	13(68.4)	6(31.6)	19(11.5)	
>45000	10(71.4)	4(28.6)	14(8.5)	

*Significant at 0.05 level

Table 4: Factors related to diabetes and level of diabetes distress

Characteristics	Level of diabetes distress		Total n(%)	p
	Little/No n (%)	Distress n (%)		
Duration of DM (in years)				
0-10	**79(70.5)**	**33(29.5)**	**112(67.9)**	**<0.001***
>10	**6(11.3)**	**47(88.7)**	**53(32.1)**	
Type of diabetic management				
Non pharmacological	**3(75.0)**	**1(25.0)**	**4(2.4)**	**ns**
Pharmacological	**82(50.9)**	**79(49.1)**	**161(97.6)**	
Treatment modalities (Type of Anti-diabetic agents)				
Oral	**63(69.2)**	**28(30.8)**	**91(56.5)**	**<0.001***
Insulin	**16(35.6)**	**29(64.4)**	**45(28.0)**	
Oral + Insulin	**3(12.0)**	**22(88.0)**	**25(15.5)**	
Diabetic complications				
Absent	**69(83.1)**	**14(16.9)**	**83(50.3)**	**<0.001***
Present	**16(19.5)**	**66(80.5)**	**82(49.7)**	
HbA1c (%)				
Good <7	**56(86.2)**	**9(13.8)**	**65(39.4)**	**<0.001***
Fair 7-8	**14(48.3)**	**15(51.7)**	**29(17.6)**	
Poor >8	**15(21.1)**	**56(78.9)**	**71(43.0)**	
Smoking status				

Never smoker	58(58.0)	42(42.0)	100(60.6)	<0.05*
Ever smoker	27(41.5)	38(58.5)	65(39.4)	
	Body Mass Index (BMI)			
Normal	35(46.1)	41(53.9)	76(46.1)	<0.05*
Overweight	50(60.2)	33(39.8)	83(50.3)	
Obese	0(0.0)	6(100)	6(3.6)	

*Significant at 0.05 level

Table 5: Predictors of diabetes distress: Logistic Regression

Predictors	OR	95% CI	P – value
Average monthly family income (in taka)	1.00	1.00-1.00	0.020
Duration of DM (in years)	1.27	1.06-1.52	0.009
Treatment modalities			
Oral $^{\Psi}$			
Insulin	5.05	1.20-21.19	0.027
Oral+ Insulin	32.43	2.99-352.21	0.004
Diabetic complications	3.92	1.09-14.19	0.037
HbA1c	1.56	1.16-2.10	0.003

$^{\Psi}$ Referral group

OR= Odds Ratio, CI= Confidence Interval, Logistic Regression: Cox and Snell R^2 = 0.552, Negelkerke R^2 =0.736, Model $\chi 2$= 129.13, df=15, p=0.000, Hosmer and Lameshow test: χ^2=5.27, df=8, p=0.729

Figure 1: Distribution of respondents according to mean of total diabetes distress score including 4 sub scale scores

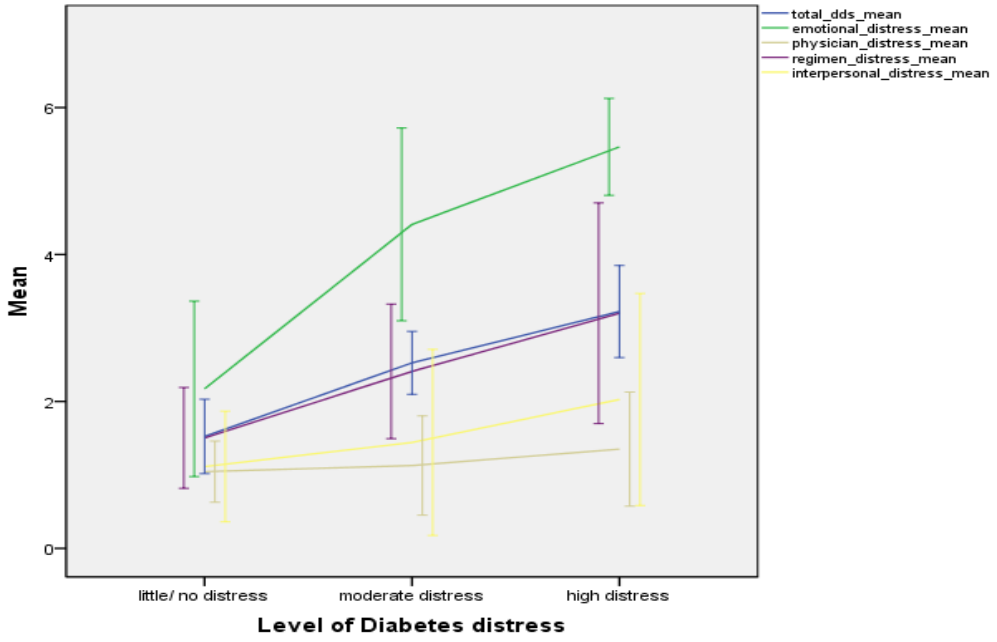
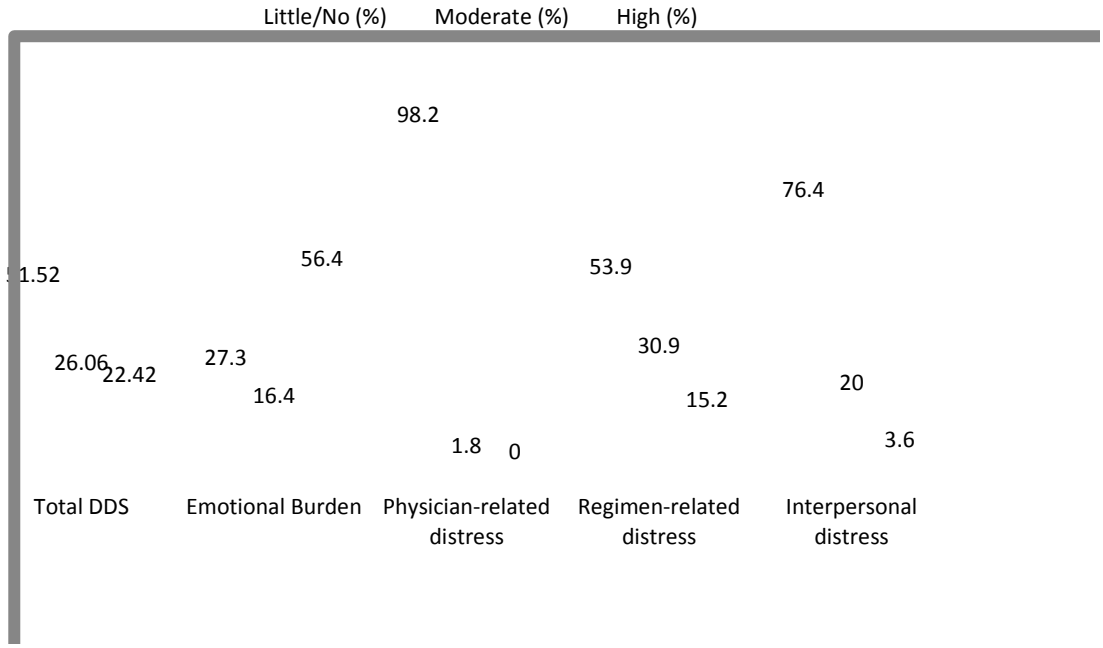


Figure 2: Distribution of respondents according to level of diabetes distress including 4 sub scale scores



The influence of duration since detection of diabetes mellitus on level of diabetes distress was statistically significant (p<0.001). The influence of treatment modalities on level of diabetes distress was statistically significant (P<0.001). The influence of diabetic complications on level of diabetes distress was statistically significant (P <0.001). The influence of glycemic status on level of diabetes distress was statistically significant (p<0.001). The influence of smoking on level of diabetes distress was statistically significant (p<0. 05). The influence of BMI on level of diabetes distress was statistically significant (p<0.05). Average duration since detection of diabetes was 8.82 ± 5.65 years. Mean BMI of the patients was 25.25 (SD 2.69 years). Majority of them were treated with oral anti-diabetic of the respondents presented with complications of diabetes. There were highest percentages of distressed symptoms among >10 years duration of DM group (88.7%), oral + insulin treatment modalities group (88.0%), having diabetic complications group (80.5%), poorly controlled HbA1c group (58.5%), obese group (100%). [Table 4]

Glycemic status measured by HbA1c was the best predictor of diabetes distress [Adjusted odds ratio (AOR) 1.56; 95% Confidence Interval (CI) 1.16 to 2.10]. Insulin users were five times more likely to develop distress (OR, 5.05 with 95% CI, 1.20 to 21.19) than users of oral anti-diabetic agents. Other predictors of diabetes distress were Duration of DM [Adjusted odds ratio (AOR) 1.27; 95% Confidence Interval (CI) 1.06 to 1.52], Diabetic complications [Adjusted odds ratio (AOR) 3.92; 95% Confidence Interval (CI) 1.09 to 14.19], Average monthly family income [Adjusted odds ratio (AOR) 1.00; 95% Confidence Interval (CI) 1.00 to 1.00]. [Table 5]

The Mean ± SD of total diabetes distress was 2.17 ± 0.75. The mean score for each domain such as emotional burden, physician-related distress, regimen-related distress and interpersonal distress was (3.49 ± 1.52), (1.13 ± 0.32), (2.12 ± 0.85), (1.40± 0.65) respectively. [Figure 1]

The proportion of diabetes distress among the study population was 48.5% which include 22.4% high distress and 26.1% moderate distress. Rest of 51.5% had little or no distress. [Figure 2]

DISCUSSION

DD is a common health problem which frequently co-exists with diabetes mellitus. The study estimated that among the adult type 2 diabetic patients 51.5% had little or no distress. But 26.1% had moderate distress and 22.4% had high distress.

This proportion of diabetes distress in this study was consistent with the study findings of Fisher L, et al. where they found prevalence of high diabetes distress among type 2 diabetic patients is 18%- 35%.[7]

The average score of total diabetes distress was 2.17 ± 0.75. The average score for each domain such as emotional burden, physician-related distress, regimen-related distress and interpersonal distress was (3.49 ± 1.52), (1.13

± 0.32), (2.12 ± 0.85) and (1.40± 0.65) respectively. 'Emotional Burden' was considered as the most important domain in measuring diabetes distress.

Another study was conducted by Shojaeezadeh D, et al. on Is Assessing Diabetic Distress an Efficient Pathway to Tailor More Effective Intervention Programs? Their study findings were also consistent with our study findings.[18]

A number of socio-demographic and clinical factors were examined for their association with diabetes distress. Logistic regression analysis was carried out to control for interaction. Significant independent associations were found between diabetes distress and HbA1c, treatment modalities and diabetic complications.[12, 13, 22]

The influence of treatment modalities on level of diabetes distress was statistically significant (p<0.001).This finding was consistent with other study finding.[9]

The influence of diabetic complications on level of diabetes distress was statistically significant (p<0.001). The influence of smoking on level of diabetes distress was statistically significant (p<0.005). The influence of BMI on level of diabetes distress was statistically significant (p<0.001).

A study was conducted by Fisher L, et al. When is diabetes distress clinically meaningful? Establishing cut points for the diabetes distress scale.[7] They found in their both 3D and REDEEM study significant for age (p=0.01), but in this study age (p <0.001); Female sex not significant, in this study female sex also not significant; HbA1c significant (p=0.13),in this study HbA1c (p<0.001); DDS 17 Mean ± SD (2.10 ± 0.96), in this study DDS 17 Mean ± SD (2.17 ± 0.75); BMI Mean ± SD (32.74 ±7.74), in this study BMI Mean ± SD (25.25 ± 2.69). Their findings were more or less consistent with our study findings.

The socio-demographic characteristics of the study sample were almost same as reported by Rahman *et al.*[24] This could be due to the same setting used for the studies.

Although optimum care had been tried by the researcher in every steps of this study, still some limitations existed. The study was conducted in a selected hospital. So the study population might not represent the whole community. Although the study place was recognized as the largest specialized center for the concerned population, still the study finding might lack external validity. Probability sampling technique could not be employed to recruit the study unit; they were selected purposively. As a result, there might be some selection bias.

CONCLUSION

This study has identified distress as a significant health problem among adult type 2 diabetes mellitus and offers important guidelines for future work in this area. The findings of the study can be used to guide the service providers and policy makers for the modification and improvement of the current Diabetes treatment guideline. The factors associated with diabetes distress need to be further studied in depth in order to formulate effective intervention program and rehabilitation.

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REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas, 5th ed. Brussels, Belgium: International Diabetes Federation, 2011.
2. World Health Organization. Diabetes mellitus. Fact sheet. No. 312, March 2013. http://www.who.int/mediacentre/factsheets/fs312/en/index.html accessed on October, 2013
3. Azad AK, Mahtab H, Grant J, Steward M, Tofayel A. Diabetes mellitus. 3rd ed. Dhaka: Diabetic Association of Bangladesh; 2010 July. P. 17-20.
4. Polonsky WH, Fisher L, Earles J, Dudl RJ, Lees J, Mullan J, et al. Assessing psychosocial distress in diabetes: development of the Diabetes Distress Scale. Diabetes Care. 2005; 28:626–31.
5. Fisher L, Mullan JT, Skaff MM, Glasgow RE, Arean P, Hessler D. Predicting diabetes distress in patients with type 2 diabetes: a longitudinal study. Diabet Med. 2009;26:622-7.
6. Fisher L, Glasgow RE, Mullan JT, Skaff M, PolonskyWH. Development of a brief diabetes distress screening instrument. Annals of family medicine. 2008;6:246-52.
7. Fisher L, Hessler DM, Polonsky WH, Mullan JT. When is diabetes distress clinically meaningful? Establishing

cut points for the diabetes distress scale. Diabetes care. 2012; 35:259-64.

8. Ting RZ, Nan H, Yu MW, Kong AP, Ma RC, Wong RY, et al. Diabetes-related distress and physical and psychological health in Chinese type 2 diabetic patients. Diabetes care. 2011;34:1094-6.
9. Delahanty LM, Grant RW, Wittenberg E, Bosch JL, Wexler DJ, Cagliero E, et al. Association of diabetes – related emotional distress with diabetes treatment in primary care patients with type 2 diabetes. Diabetes medicine. 2007;24:48-54.
10. Rahim MA, Hussain A, Azad Khan AK, Sayeed MA, Keramat Ali SM, Vaaler S. Rising prevalance of type 2 diabetes in rural Bangladesh: a population based study. Diabetes research and clinical practice. 2007;77:300-5.
11. Rahim MA, Khan AK, Ali SMK, Nahar Q, Shaheen A, Hussain. Glucose tolerance in a rural population of Bangladesh. International journal of Diabetes in Developing countries. 2008;28(2):45-50.
12. Fisher L, Mullan JT, Arean P, Glasgow RE, Hesslar D, Masharani U. Diabetes distress but not clinical depression or depressive symptoms is associated with glycemic control in both cross-sectional and longitudinal analyses. Diabetes Care. 2010;33(1):23-8.
13. Fisher L, Skaff MM, Mullan JT, Arean P, Glasgow R, Masharani U. A longitudinal study of affective and anxiety disorders, depressive affect and diabetes distress in adults with Type 2 diabetes. Diabet Med. 2008;25:1096-101.
14. Fisher L, Skaff MM, Mullan JT, Arean P, Mohr D, Masharani U, et al. Clinical depression versus distress among patients with type 2 diabetes: not just a question of semantics. Diabetes Care. 2007;30:542-8.
15. Mullan JT, Fisher L, Skaff MM, Polonsky WH. The Diabetes Distress Scale: a replication (Abstract). Diabetes. 2006;55(Suppl.1):A426-7.
16. Liu MY, Tai YK, Hung WW, Hsieh MC, Wang RH. Relationships between emotional distress, perception and self-care behavior and quality of life in patients with type 2 diabetes. Hu Li Zhi. 2010;57(2):49-60.
17. Tang TS, Brown MB, Funnell MM, Anderson RM. Social support, Quality of life and Self-care Behaviors Among African Americans With Type 2 Diabetes. The Diabetes EDUCATOR. 2008;34(2):266-76.
18. Shojaeezadeh D, To A, Sharifirad G, Eslami A. Is Assessing Diabetic Distress An Efficient Pathway To Tailor More Effective Intervention Programs? Geneva Health Forum 2012.
19. Fisher L. Diabetes Self-Management Articles. Eight Tips for Managing Diabetes Distress.[Internet] [December 28, 2006]. Available from: http://www.diabetesselfmanagement.com/articles/emotional-health/eight_tips_for_managing_diabetes_distress/1/ accessed on October, 2013
20. Wisconsin Diabetes Mellitus Essential Care Guidelines 2011. Section 10: Emotional and sexual health care, page 10-5.http://www.dhs.wisconsingov/diabetes/PDFs/GLID.pdf accessed on October, 2013
21. Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalence of Diabetes Mellitus: Follow-up report on the diagnosis of diabetes mellitus. Diabetes Care. 2003:26:3160-7.
22. Van Bastelaar KM, Pouwer F, Geelhood-Duijvestijn PH, Tack CJ, Bazelmans E, Beekman AT, Heine RJ, Snoek FJ. Diabetes-specific emotional distress mediates the association between depressive symptoms and glycemic control in Type 1 and Type 2 diabetes. Diabet Med 2010;27(7):798-803.
23. Akhter A, Fatema K, Afroza A, Bhowmic B, Ali L, Hussain A. Prevalance of Diabetes Mellitus and its Association Risk Indicators in a Rural Bangladeshi population. The Open Diabetes Journal. 2011;4:6-13.
24. Rahman M, Rahman MA, Flora MS, Rakibuz-zaman M. Depression and associated factors in diabetic patients attending an urban hospital of Bangladesh. International Journal of collaborative Research on Internal Medicine and Public Health. 2011;3:65-76.
25. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation of Obesity. Geneva: World Health Organization; 3-5 June 1997. http://www.bvsde.paho.org/bvsacd/cd66/obeprev/indice.pdf accessed on October, 2013