

Original research article

# Assessment of the socio demographic variables, diabetes distress, depression and their relationship with glycemic control in patients with type 2 diabetes mellitus in sub-Himalayan region of North India

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### Abstract

**Background:** DM is a significant health problem and most common non-communicable disease throughout the globe. Over the past few decades, both the number of cases and the prevalence of diabetes have been increasing steadily. Diabetes distress (DD) is a distinct condition which is often mistaken for depression and is related to adverse disease outcomes. Diabetic patients experience many psychiatric comorbidity that are significantly associated with impaired health and quality of life. Different measures to assess depression can help identify the higher risk of type 2 diabetes in individuals. **AIM:** To assess the Socio demographic variables, Diabetes Distress, Depression and their relationship with glycemic control in patients with Type 2 DM in Sub-Himalayan region of North India.

### Objectives:

- 1) To assess the Socio demographic variables and Diabetes Distress.
- 2) To assess the Socio demographic variables and Depression.
- 3) To assess the association between Socio demographic variables, Diabetes Distress and Depression in patients with Type 2 DM.

**Material and Methods:** The study was conducted at Indira Gandhi Medical College (IGMC), Shimla, which is a tertiary care centre of Himachal Pradesh. It is a descriptive cross-sectional study. 223 eligible patients were enrolled who were patients attending medicine and psychiatry department of IGMC, Shimla from March 2020 to February 2021 who had been diagnosed with Type 2 DM. Further, the socio-demographic details were recorded on a semi-structured proforma and then diabetes distress scale (DDS) for diabetic distress and Hamilton depression rating scale (HAM-D) for depression was administered. Descriptive data on socio demographic variables was analysed by using percentage, mean and standard deviation. For categorical variables, chi-square ( $\chi^2$ ) test was used.

**Results:** Findings on chi-square test, p values revealed a statistically significant association between diabetes distress, gender, educational and socio-economic status. More diabetes distress was found in females, educated upto high school with lower middle socio-economic status. Association between age group, marital status, locality and family type was not found statistically significant ( $P > 0.05$ ). Further, a statistically significant association between HAM-D scores, gender groups, educational and socio-economic status was found. However, no significant association was found with age, marital status, locality and family type.

**Conclusion:** This study is informative regarding the association between these variables to improve existing therapeutic strategies or help in developing effective interventions for these patients. Clinicians should screen and identify the potential risk and thus, timely referral to both mental health and diabetes professionals should be done.

**Keywords:** Diabetic distress, depression, socio demographic variables, type 2 DM, HbA1c (Glycemic Control), Hamilton Depression Rating Scale (HAM-D), Diabetes Distress Scale (DDS)

### Introduction

DM is a significant health problem and most common non-communicable disease throughout the globe<sup>[1]</sup>. As per the recent data from the International Diabetes Federation (IDF) Diabetes Atlas, 10th edition, the prevalence of diabetes has continuously increased globally, making it a significant global challenge to the health and well-being of individuals, families and societies. Diabetes has led to about 6.7 million deaths in 2021 i.e. one every five seconds. According to the current trends, it has been

projected that 537 million adults (20-79 years) are living with diabetes i.e. 1 in 10. It is predicted that by 2030, a rise of 643 million and 784 million by 2045 will have the disease worldwide. Moreover, estimated 541 million people have impaired glucose tolerance (IGT), which places them at high risk of developing type 2 diabetes<sup>[2]</sup>.

The risk factors associated with diabetes include age, hypertension, obesity, marital status and family history of DM. It has been reported that diabetes patients develop strained relationships with their family members and friends and it also affects their trust and understanding with the health-care providers. Under such stressful conditions, the motivation for self-care is seriously impaired<sup>[3-4]</sup>.

Diabetes distress is the emotional distress resulting from living with diabetes and the burden of relentless daily self-management. It occurs on a continuum defined by its content and severity<sup>[5-6]</sup>. Diabetic Distress can be explained by the concerns that the patient might have regarding the management of the disease, support, the emotional implications and availability of care and guidance<sup>[7]</sup>.

A study done by Fisher *et al.* in 2007-2008 suggested that although clinical depression is common among patients with DM, most of the patients are not clinically depressed but are usually distressed about the management course of their illness. Depression can be measured based on clinical diagnosis with the use of depressive symptom scales or medication use. Different measures to assess depression can help identify the higher risk of type 2 diabetes in individuals<sup>[8,9]</sup>.

A research was done by Raval A in Aug 2010 at a tertiary care hospital in north India. 300 Patients with established T2DM were evaluated for depression, out of which 147(49%) were males and 153(51%) were females with the median duration of diabetes being 8(4-13) yrs. A strong association between depression and age >54 yr (OR: 1.26, 95%; CI:1.02-1.67; P=0.004) (OR: 1.27, 95%; CI:1.01-1.44; P=0.035) was noted. This study, revealed that a higher prevalence of depression was seen in patients with T2DM. The major risk factors for development of depression were age, central obesity, diabetic complications particularly neuropathy and diabetic foot disease and increased pill burden<sup>[10]</sup>.

Islam MR (2013) in a cross-sectional study conducted from January to June 2012, with 165 adults with type 2 diabetes, found a proportion of diabetes distress in 48.5% patients. The most important domain to measure diabetes distress was seen to be emotional burden. The various factors associated with the level of distress were age (p<0.001), occupation (p<0.05), smoking (p<0.005), Body Mass Index (BMI) (p<0.001)<sup>[7]</sup>.

In April 2014, Wardian *et al.* tried to find the factors associated with diabetes-related distress and its association with self-management and lower HbA1C with the help of a cross-sectional study design with 267 adults with Type 2 diabetes. Higher DDS was related to younger age, higher body mass index, lower self-efficacy, lower levels of health care provider support and an unhealthy diet. A significant factor in reducing DDS was the support provided by the health care providers by providing education including strategies to increase self-efficacy and assisting people with diabetes to have a healthier lifestyle<sup>[11]</sup>.

Chew *et al.* in 2015, did a study in adults with type 2 DM to examine the associations of diabetes-related distress (DRD), depressive symptoms, health-related quality of life (HRQoL), medication adherence with glycemia, blood pressure (BP), and lipid biomarkers. It was a cross sectional study design set to study the Malaysian population in three public health clinics in 2012-2013. Adult patients (aged  $\geq 30$  years) who were on active follow up after being diagnosed with type 2 diabetes for more than one year were included in the study. Out of the 752 patients 700(93.1%) responded and the majority were females (52.8%), Malay (52.4%) and married (78.7%). DRD was associated with systolic BP ( $r = -0.16$ ,  $P=0.066$ ); depressive symptoms with low-density lipoprotein cholesterol ( $r=0.12$ ,  $P=0.061$ ); medication adherence with HbA1c ( $r = -0.14$ ,  $P=0.082$ ). Therefore, the glycemic levels, BP, and lipid biomarkers were significantly and distinctly associated with all these factors. Hence, management of these risk factors should be done at a primary care level with the help of a multidisciplinary approach<sup>[12]</sup>.

Chew *et al.* in 2016 Malaysia on 700 patients with Type 2 DM (T2DM). Adults above the age of 30 years who have had type 2 diabetes for more than 1 year and are regularly followed up along with their recent laboratory results (<3 months) were included. After analyses using a generalized linear model it was found that out of the 700 participants 52.8% were females, 52.9% Malay, 79.1% married and mean age was 56.9 years. The prevalence of DRD and depression was seen to be 49.2% and 41.7%, respectively. Correlation between distress and depression was found out by spearman's  $r = 0.50$ . DRD was seen in younger patients who had a higher score on the PHQ. Depression was seen to be more in divorced/separated patients with more microvascular complications (OR: 1.4, 95%; CI:1.06 to 1.73) and higher DDS (OR: 1.03, 95%; CI:1.02 to 1.03). Both DRD and depression was seen to be positively correlated to an employment (OR: 4.7, 95%; CI: 1.02 to 21.20)<sup>[13]</sup>.

Prasad *et al.* 2017 did a cross sectional study on outpatients of the medicine department of tertiary care hospital in South India. They found that among the 250 study participants, depression was found in 142 (56.8%) and diabetes distress in 6 (2.4%) patients. With the magnitude of depression; being somewhat similar in both male and female. Moreover, Depression was seen to be more among illiterates, unemployed (70%), single, separated individuals and patients with complications of diabetes. no significant association between religion and low economic status was noted with depression. A

statistically significant association was noted between diabetic distress and co-morbid conditions. It was found that the prevalence of depression and distress in diabetic patients is high. Therefore, early detection, counselling and treatment should be considered for all diabetic patients<sup>[14]</sup>.

Gahlan *et al.* in 2018 conducted a cross-sectional study including a total of 410 patients having T2DM who had attended the endocrine OPD. High diabetes distress scores among diabetic cases were majorly predicted by low education level, retinopathy, neuropathy and hypertension. Emotion related diabetes distress was found to be more prevalent. Risk factors contributing to the high diabetes distress were, lower educational level and the presence of diabetic complications<sup>[5]</sup>.

Sharif *et al.* in 2019 conducted a cross-sectional study in a tertiary care hospital in Pakistan. Out of the 100 subjects included in the study, mean age was seen to be  $58.3 \pm 12.4$  (range: 36-71) years. Females were 1.2 times more affected than males. Mean duration of type 2 DM was seen as  $11.2 \pm 9.2$  years with the mean PHQ-9 score being  $10.2 \pm 8.1$ . Depression was observed to be in 40.0% of the study population. Depression was found to be more frequent in women with 60% patients being between the age of 40-60 years<sup>[15]</sup>.

Kanwar *et al.* (2019) from August 2016 to July 2017 screened a total of 320 type 2 diabetes patients coming to the medicine OPD of IGMC, Shimla from which 202 patients were included. The mean age of the participants was  $50.63 \pm 09.37$  years and females comprised 48% of the study population. 64% patients belonged to a rural area, 63.9% were farmers by profession and 95% were married. 92.5% of patients were educated up to matriculate or were graduates and 80.2% belonged to a joint family setting with only 19.8% belonging to a nuclear type of family. The socioeconomic status of the participants was distributed among middle class and lower class as 72.3% and 27.7% respectively<sup>[16]</sup>.

A cross-sectional study with 142 adult patients with type 2 diabetes by Sumana *et al.* 2019, in the endocrinology outpatient clinic of a tertiary care centre in Telangana, India. According to their findings, out of the 142 participants, 63 (44.36%) were females and 79 (55.63%) were males with the mean age being  $53.94 \pm 12.25$  years<sup>[17]</sup>.

Ratnesh *et al.* (2020). Studied 250 type 2 diabetes patients. Diabetes distress was found to be prevalent in 19.6% patients with the risk being 4.25 times increased in patients with age  $\leq 45$  years and 8.8 times more in patients with HbA1c  $> 8$ . DD was observed to be higher in illiterates, aged  $\leq 45$  years, patients on insulin therapy and those with HbA1c  $> 8$ . HbA1c was also found to be higher in patients with higher diabetic distress<sup>[18]</sup>.

A cross-sectional study was done by Huynh *et al.* (2021) on type 2 diabetes patients between April to November 2020 at three hospitals in Vietnam. Among the 517 participants in the study, most patients were over sixty years old (56.8%) with females being 65.0%. moderate and high distress was seen in 23.6% and 5.8% patients respectively<sup>[19]</sup>.

A research was conducted by Sharma *et al.* (2021) on 296 type 2 diabetes patients admitted in the Chitwan Medical College and Teaching Hospital. Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorders-7 (GAD-7) was used to interview the patients. Descriptive data analysis showed that 48.6% patients were 60 years and above, 59.5% were female, 61.5% were literate 38.2% were agriculturist. 57.8% were observed to have depression and 49.7% had anxiety. Mild, moderate, moderately severe and severe depression was seen in 27.4%, 19.6%, 8.4%, and 2.4% of patients respectively. Depression was associated with educational status, smoking habit, treatment satisfaction, and family history of diabetes<sup>[20]</sup>.

Both diabetic distress and depression are commonly associated with diabetes and can significantly affect health outcomes. By review of literature it has come to notice that a little research work on this important health issue has been done in India especially in Himalayan sub-continent. Therefore, the present study is planned by keeping in mind the practical and applied utility of the present research.

## AIM

To assess the Socio demographic variables, Diabetes Distress, Depression and their relationship with glycemic control in patients with Type 2 DM in Sub-Himalayan region of North India.

## Objectives

1. To assess the Socio demographic variables and Diabetes Distress in patients with Type 2 DM.
2. To assess the Socio demographic variables and Depression in patients with Type 2 DM.
3. To assess the association between Socio demographic variables, Diabetes Distress and Depression in patients with Type 2 DM.

## Material and Methods

**Study setting:** The study was conducted at Indira Gandhi Medical College (IGMC), Shimla, which is a tertiary care centre of Himachal Pradesh.

**Study design:** It is a descriptive cross-sectional study.

**Sample size:** The study included 330 patients of T2DM screened, 223 eligible patients were enrolled for the present study patients attending medicine and psychiatry department of IGMC, Shimla from March 2020 to February 2021 who had been diagnosed with Type 2 DM.

The patients fulfilling following inclusion and exclusion criteria and who gave informed consent were enrolled.

### Inclusion criteria

- 1) Patients between 18-60 years of age, admitted to or consulting on OPD basis to the Medicine and Psychiatric departments of Indira Gandhi Medical College, Shimla, having type 2 DM.

### Exclusion criteria

- 1) Patients with chronic medical (CKD/Hypertension/CAD) or surgical illness other than DM.
- 2) Patients on long term treatment for other medical illness/terminally ill/who required immediate hospitalization for serious illness.
- 3) Patients who were on corticosteroids or any psychotropic drugs and having any other co-morbid psychiatric illness.

### Instruments and Tools

1. **Socio-demographic profile sheet:** Was used to record information regarding demographic variables in a semi-structured format. The Scale devised by Kuppaswamy *et al.* was used to determine socioeconomic status<sup>[21]</sup>.
2. **Diabetes Distress Scale (DDS):** Fisher and his colleagues have created a brief diabetes distress screening instrument for clinical setting use. William Polonsky and Fisher in 2007 had developed a scale of 17-items. A 2-item diabetes distress screening instrument (DDS-2) that asks patients to rate on 6-point scale. If a patient answers affirmatively to the DDS-2 questions, the DDS-17 can be administered to help in defining the content of distress and to direct intervention. These 17 items include emotional burden, physician related distress, regimen-related distress and interpersonal distress. Each item is rated considering the degree to which each of the 17 items may have distressed or bothered the diabetic patients during the past month. Mean item score of  $\geq 3$  taken as a level of distress worthy of clinical attention. It has also a consistent, generalizable scale which has good internal reliability and validity<sup>[22]</sup>.
3. **The Hamilton Depression Rating Scale (HAM-D):** It was developed during the late 1960s as a standardized scale for the measurement of the severity of depressive symptoms. The 17 item version was used which has good cross validity than other versions that include 21 and 24 items. The scale is designed to yield a total score based on all 17 items. HAM-D has emerged as the most widely used scale for patient selection and follow up in research studies of treatments for depression. HAM-D score has proved reliable and to have a high degree of concurrent and differential validity. It's a Likert scale of either 0 to 4 or 0 to 2. Scores can range from 0 to 54. HAM-D scores are classified as normal ( $<9$ ), mild depression (10 to 13), mild to moderate depression (14 to 17) and moderate to severe depression ( $>17$ )<sup>[23, 24]</sup>.

### Procedure

Patients selected in the study fulfilled the inclusion criteria above the age of 18 years after taking informed consent. The socio-demographic details i.e. age, sex, income of family, residence and type of family was recorded on a semi-structured performa from patient and close family member. Then they were interviewed individually and subjected to Diabetes distress scale (DDS) and Hamilton depression rating scale (HAM-D) for assessment of distress, depression and glycemic control. Routine blood investigations with HbA1c, FBS/RBS and fundus examination were carried out.

### Statistical analysis

Following collection of the data with patients' responses, data was analyzed using statistical software Epi-Info version 7. Descriptive data on socio demographic variables was analyzed by using percentage, mean and standard deviation. For categorical variables, chi-square ( $\chi^2$ ) test was used. The differences in the distribution of categorical and continuous variables were compared by using chi square test of  $P \leq 0.05$  level of significance.

### Results

This study was conducted with the aim to assess the Diabetes Distress, and their relationship with glycemic control in patients with type-2 diabetes mellitus. For this purpose a total of 223 patients who fulfilled the inclusion criteria were enrolled in the study from Psychiatry and Medicine department of IGMC, Shimla from March 2020 to February 2021; who have been diagnosed with type-2 diabetes mellitus after obtaining the informed consent.

Table 1: Showing Socio demographic Variables of the sample (n=223)

Sociodemographic Variables		No of Pts./%
Age Group (Years)	18-30	2/0.90%
	31-40	8/3.59%
	41-50	69/30.94%
	51-60	144/64.57%
Gender	Male	139/62.3%
	Female	84/37.7%
Locality	Rural	104/46.6%
	Urban	119/53.4%
Marital status	Married	206/92.38%
	Unmarried	2/0.9%
	Widowed	15/6.73%
Educational Status	Illiterate	52/23.3%
	Less than high school	38/17.1%
	Upto high school	96/43.0%
	Diploma or higher	37/16.6%
Socio Economic Status	Upper	4/1.8%
	Upper Middle	93/41.7%
	Lower Middle	89/39.9%
	Upper Lower	34/15.2%
	Lower	3/1.3%
Family type	Nuclear	111/49.8%
	Extended	49/22.0%
	Joint	63/28.3%

Findings on Table 1 revealed that the mean age of the participants was found to be  $52.07 \pm 6.58$ , i.e., two third (64.57%, n= 144) of patients belonged to the 51-60 years age group. 30.94%(n=69) belonged to the age group of 41-50 years, 3.59%(n=8) were of the age group 31-40 years and only 2 patients(0.9%) belonged to the age 18-30 years.Out of 223 patients, 139 (62.3%) patients were males and 84 (37.7%) were females. This represents a male to female ratio of 1.6:1. Majority of the patients belonged to urban background (n=119; 53.5%) and 46.6% (n=104) belonged to rural background. More than three fourth, 86.1% (192) patients were married, 2 (0.9%) were unmarried, and 29 (13.0%) patients were widowed Majority of patients 96(43.0%) were educated up to high school, followed by 52 patients (23.3%) were illiterate, 38 (17.1%) were educated less than high school and 37 (16.6%) patients were educated upto diploma or higher. Majority of patients (n=182; 81.6%) belonged to middle socioeconomic status, while only a few (n= 37; 16.5%) belonged to lower socioeconomic status and (n=4; 1.8%) belonged to upper socioeconomic status. About half the patients belonged to nuclear family (n=111; 49.8%), 63 (28.3%) patients belonged to joint family and only 49 (22%) patients belonged to extended family.

**B. Association between DDS score and socio-demographic variables**

The significant association was found between gender (more in females), educational status (more in high school) and socio-economic status (more in lower-middle). However association between diabetes distress, age group, marital status, locality and family type, p-values was not found to be significant.

Table 2: Association between DDS score and socio-demographic variables

Variables	DDS score	<2 mild or no distress	2.0-2.9 mod distress	>_3 severe distress	Total	P value
Age group	18-30 yrs	0(0.0%)	0(0.0%)	2(100%)	2	NS
	31-40 yrs	4(50.0%)	3(37.50%)	1(12.50%)	8	
	41-50 yrs	48(69.57%)	17(24.64%)	4(5.80%)	69	
	51-60 yrs	109(75.69%)	27(18.75%)	8(5.56%)	144	
Gender	Males	113(81.29%)	19(13.67%)	7(5.04%)	139	0.000 S
	Females	48(57.14%)	28(33.33%)	8(9.52%)	84	
Marital status	Married	150(72.82%)	43(20.87%)	13(6.31%)	206	NS
	Unmarried	0(0.0%)	0(0.0%)	2(100%)	2	
	Widowed	11(73.33%)	4(26.64%)	0(0.0%)	15	
Locality	Rural	70(67.3%)	28(26.9%)	6(5.8%)	104	NS
	Urban	91(76.5%)	19(16.0%)	9(7.6%)	119	
Family type	Nuclear	84(75.7%)	22(19.8%)	5(4.5%)	111	NS
	Extended	32(65.3%)	12(24.5%)	5(10.2%)	49	
	Joint	45(71.4%)	13(20.6%)	5(7.9%)	63	
Education status	Illiterate	33(63.46%)	16(30.77%)	3(5.77%)	52	0.009 S
	Primary school	21(55.2%)	12(31.6%)	5(13.2%)	38	

Socio-economic status	Upto High school	73(76.04%)	17(17.71%)	6(6.25%)	96	0.007 S
	Diploma or higher	34(91.9%)	2(5.4%)	1(2.7%)	37	
	Upper	3(75%)	1(25%)	0(00%)	4	
	Upper middle	80(86%)	9(9.7%)	4(4.3%)	93	
	Lower middle	59(66.3%)	23(25.8%)	7(7.9%)	89	
	Upper lower	18(52.9%)	12(35.3%)	4(11.8%)	34	
	lower	1(33.3%)	2(66.7%)	0(00%)	3	

Chi-Square test, P≤0.05: statistically significant(S)

**C. Association between HAM-D score and socio-demographic variables**

Significant association was found between total HAM-D Score and Gender Grouping (more in females), educational status (primary and middle school pass) and socio-economic status (lower middle and lower class. No significant association was found between HAM-D score and age, marital status, locality and family type.

**Table 3:** Association between HAM-D score and socio-demographic variables

Variables	HAMD score	≤9 normal	10-13 mild	14-17 moderate	>17 moderate to severe	Total	P value
Age group	18-30 yrs	0(0.0%)	0(0.0%)	0(0.0%)	2(100%)	2	NS
	31-40 yrs	0(0.0%)	3(37.50%)	3(37.50%)	2(25%)	8	
	41-50 yrs	11(15.94%)	27(39.13%)	17(24.64%)	14(20.29%)	69	
	51-60 yrs	36(25%)	53(36.81%)	32(22.2%)	23(15.97%)	144	
Gender	Males	25(17.99%)	65(46.76%)	30(21.58%)	19(13.67%)	139	0.001 S
	Females	22(26.19%)	18(21.43%)	22(26.19%)	22(26.19%)	84	
Marital status	Married	46(22.33%)	78(37.86%)	47(22.82%)	35(16.99%)	206	NS
	Unmarried	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100%)	2	
	Widowed	1 (6.67%)	5 (33.3%)	5 (33.3%)	4 (26.67%)	15	
Locality	Rural	18 (17.3%)	38 (36.5%)	27 (26.0%)	21 (20.2%)	104	NS
	Urban	29 (24.4%)	45 (37.8%)	25 (21.0%)	20 (16.8%)	119	
Family type	Nuclear	30 (27.0%)	35 (31.5%)	27 (24.3%)	19 (17.1%)	111	NS
	Extended	8 (16.3%)	22 (44.9%)	10 (20.4%)	9 (18.4%)	49	
	Joint	9 (14.3%)	26 (41.3%)	15 (23.8%)	13 (20.6%)	63	
Education status	Illiterate	2 (3.8%)	18 (34.6%)	23 (44.2%)	9 (17.3%)	52	0.000 S
	Less than high school	0 (0.0%)	20(52.6%)	4(10.5%)	14 (36.8%)	38	
	High school	35 (36.5%)	31 (32.3%)	14 (14.6%)	16 (16.7%)	96	
	Intermediate or diploma	10 (27.03%)	14 (37.8%)	11 (29.7%)	2(5.4%)	37	
Socioeconomic status	Upper	0 (0.0%)	1 (25%)	3 (75%)	0 (0.0%)	4	0.000 S
	Upper middle	30 (32.3%)	29 (31.2%)	25 (26.9%)	9 (9.7%)	93	
	Lower middle	17 (19.1%)	42 (47.2%)	6 (6.7%)	24 (27.0%)	89	
	Upper lower	0 (0.0%)	11 (32.4%)	16 (47.1%)	7 (20.6%)	34	
	lower	0 (0.0%)	0 (0.0%)	2 (66.7%)	1 (33.3%)	3	

Chi-Square test, P≤0.05: statistically significant(S)

The above table the significant P value (<0.05) was seen females, belonging to the lower education status and middle class families. No significant association was seen with age group, locality or the family type.

**Discussion**

The present study was planned to assess the Socio demographic co-relates, Diabetes Distress, Depression and their relationship with glycemic control in patients with Type 2 DM in Sub-Himalayan region of North India. Out of 330 patients of T2DM screened, 223 eligible patients were enrolled for the present study.

Mean age in the present study was 52.10 ± 06.58 years and most of the patients were from 51-60 years age group (n=144; 64.57%) and 69; 30.94% were from 41-50 years age group. Further majority of the patients were from age group of 40-60 years, which was similar with other studies [16, 21, 25].

Further, out of 223 patients, 139 (62.3%) were males and 84 (37.7%) were females, similar to the findings seen by Ratnesh KS *et al.*[18] and Majed O. Aljuaid *et al.*[26]. Majority of patients were belonging to Hindu religion, (n=215; 96.4%) and urban, (n=119; 53.4%) and 104 (46.6%) from rural background. In the present study, 206 (92.38%) patients were married similar to the study by Parsa S *et al.* [27]. In the various other studies from the sub-continent, 78% to 92% patients were married which is in consistent with the present study[16, 28].

Most of the patients (n=134; 60.1%) were educated upto high school, 52 (23.3%) were illiterate followed by 29 (13%) were educated upto graduation and only 8 (3.6%) were professionals. Somewhat different results have been observed in the earlier studies[7, 16]. In the present study, majority (n=103; 46.2%) were employed, followed by 98 (43.9%) were self-employed and 22 (9.9%) patients were unemployed. Higher prevalence of diabetes was seen in employed and self-employed (including farmers)[16].

A majority of patients (n=182; 81.6%) belonged to the middle socio-economic (upper and lower middle class) as measured by modified Kuppaswamy S. Socio-Economic Scale<sup>[16,21]</sup> and only 3 (1.3%) were from lower socio-economic status. A majority of the patients (n=111; 49.8%) lived in the nuclear family setting and 63 (28.3%) in the joint families which was somewhat different from the findings of Kanwar N *et al.*<sup>[16]</sup>.

To assess second objective of the study Chi-square test was used to determine the association between diabetes distress, demographic data. P-values revealed; a significant association between diabetes distress, gender, educational and socio-economic status at ( $P \leq 0.05$ ) level of significance. Diabetes distress was seen to be more in females as compared to males. This could be attributed to gender specific issues like pregnancy, post-partum and menstrual cycle changes, responsibility at work and home, caring for children and family which leads to distress, similar to the earlier studies<sup>[5,27,28]</sup>.

Furthermore, diabetes distress was found in those educated up to high school and illiterate patients, belonging to the lower middle socio-economic status & similar to the findings of earlier researches<sup>[5,18]</sup> in which it was mentioned that who are illiterate and less educated have 2-3 times more risk of developing diabetes distress as compared to literates. Probably, this is because of less educational level (up to matric) which leads to poor knowledge about DM, its complications and management. However, association between age groups, marital status, locality and family type was not found to be statistically significant ( $P > 0.05$ ).

For the 3<sup>rd</sup> objective after diabetes distress an association between HAM-D scores, socio-demographic, was assessed. Result findings showed a significant association between HAM-D scores, gender grouping, educational and socio-economic status. However, no statistically significant association was found with age, marital status, locality and family type. Findings regarding the gender group moderate to severe depression in females in 22 (26.19%) as compared to male 19 (13.67%). Prevalence of depression was slightly higher in female patients as compared to that in males (23.9% vs. 18%)<sup>[16]</sup>. The higher prevalence of depression in females was influenced by adverse experiences, socio-cultural roles, psychological attributes, biological factors, including hormones and poor social support.

In addition, a significant negative correlation was found between age and diabetes distress scores, depression and HbA1C values. It depicted that older the age, severity of depression, diabetes distress and HbA1C values will decrease. Similar results were reported in a study, diabetic distress in young patients was reportedly higher than it was among elderly patients<sup>[13]</sup>. Young people often have many responsibilities, like providing support to their children and elderly family members, management of their households by handling financial and career related responsibilities.

To conclude the findings of the study, it is hoped that this study is informative regarding the Clinicians should screen and identify the potential risk and thus, timely referral to both mental health and diabetes professionals should be done.

### Limitations of the study

Although a very useful and applied research still present research has also few limitations. It is done only in one hospital setting. Sample size was small. So the findings might not represent the whole community, so it lacks external validity. Probability sampling techniques could not be applied to the results of the study because purposive sampling was used. A descriptive cross-sectional design; therefore, the casual-casualty relationship between the variables cannot be considered. DDS is well known scale to measure diabetes distress, but it was not validated in our country. A prospective study design needs to be planned to see the better association of diabetes distress, depression and other psychiatric co-morbidities with Type-2 DM.

### Strengths and Future directions

Diabetes distress, depression and their association with glycemic control was studied in Type-2 DM patients. Consultation liaison researches was emphasised by doing research including both Psychiatry and Medicine Departments.

It is applied and useful research in current trends. This research will open new vistas for future researches and help in planning, policies and interventions. The recommended steps should be taken to counsel the patients regarding the chronic course of the disease and educate them about the modifications needed in lifestyle. Findings of the present study will help Health Care Providers and Clinicians to know where to focus to reduce diabetes distress.

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