Research article

A cross sectional study on depression among a cohort of type II diabetes mellitus subjects attending a rural health training center in Tamil Nadu

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ABSTRACT

Introduction and Aim: The association between Type II Diabetes Mellitus (DM) and depression is bi-directional. In Type II DM patients with depression, the compliance to treatment is poor**.** The aim was to describe the prevalence of depression in Type II DM and to determine the associated factors.

Materials and Methods: A cross sectional study was done on 440 subjects with Type II DM attending a Rural health training center (RHTC) in Pulipakkam, Tamilnadu from January to December 2019. PHQ-9 questionnaire was used to assess depression prevalence. SPSS 20 was used for data entry and analysis. Qualitative variables were expressed as proportions with 95% Confidence Intervals (C.I.). Quantitative variables were expressed as Mean ± S.D. A p value of <0.05 was considered as the level of statistical significance. Chi-square test was used to test the association between various risk factors and depression in Type II DM.

Results: Majority of the participants were >60 years (41.9%), lived in nuclear family (67.7%), had education of middle school (29.1%), were Overweight or Obese (61.8%). The overall prevalence of depression was 36.36% with 95% C.I. of 31.86% to 41.05%. Female gender (p=0.022), BMI<18.5 (p=0.035), living in nuclear family (p=0.004), being illiterate (0.006) and newly diagnosed (<1 year from diagnosis) with DM (p=0.0183) were factors significantly associated with Depression in Type II DM.

Conclusion: The prevalence of depression was high in Type II DM. Identification of risk factors can help in early initiation of treatment of Depression in Type II DM.

Keywords: Depression; type II diabetes mellitus; prevalence; PHQ-9.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease-causing significant morbidity and mortality globally. According to the 9th edition of international Diabetes Federation atlas (2019), around 10% of the total global health expenditure is used up for diabetes. Majority (79%) of the subjects with DM are from low and middle income countries (1). The worldwide prevalence of diabetes mellitus in 2019 was projected at 9.3% and it is estimated to increase by 2030 to 10.2% and by 2045 to 10.9% (2). The main problem with DM is that nearly half of the subjects with Type II diabetes do not know they have DM. Another highly prevalent illness exhibiting an iceberg phenomenon is Depression. Worldwide in 2019, an estimated 264 million people were suffering from depression(3). Compared to the general population, the global prevalence of depression (4) is two times higher in subjects with Type II DM (19.1% Vs 10.7%). The prevalence of depression in Type II DM was reported as 20% according to DIAbetes and DEpression in MAdrid (DIADEMA), a study done in Spain (5). In a study done in Tamil Nadu, the prevalence of Depression among Type II DM was 39.7% (6). The overall incidence rate of depression in Type II DM in the study by Lunghi *et al.,* (7) was 9.47 per 1000 persons per year during a median follow up of 4.23 years for the whole cohort. The incidence rate of depression in the study by Lunghi *et al* ., (7) for the duration of first year after initiating oral anti-diabetic treatment was 12.6 per 1000 person per year. The association between depression and Type II DM is bi-directional (8-10). Type II Diabetes Mellitus is a risk factor for depression (7, 11). Depression can also increase the risk of developing Type II DM (8, 12). There are evidence from various systematic reviews and meta-analyses supporting the association between DM and depression (4, 8, 11, 13). But evidence from certain large population studies does not support the role of DM as a risk factor for depression (14, 15). There are contrasting results about the association of DM and depression.

Most of the patients are diagnosed to have diabetes mainly during routine checkup. Hence, there is an

increased risk of having diabetic complications by the time of diagnosis itself**.** Depression, an important mental health problem usually goes unidentified, resulting in poor management (16). Socioeconomic, individual, behavioral and clinical related factors are some of the predictors of depression which go unnoticed in a Diabetic patient (17). Diabetes and mental disorders, when existing together, also increase the risk of cardiovascular complications of T2DM and mortality (18). The compliance with treatment recommendations is also poor among T2DM patients with depression than without depression (19). The cardiovascular risk factors like smoking, obesity, sedentary lifestyle and poor glycemic control are more frequent among depression patients, resulting in poor quality of life (5). Effective methods of screening might reduce the number of undiagnosed individuals and help more people to get the therapy they need. Hence this study was carried out to estimate the prevalence of Depression among subjects with type II DM and to describe the associated factors. The objectives of the study were to estimate the prevalence of depression among type II diabetes mellitus patients and determine the factors associated with depression in Type II DM.

METHODS AND MATERIALS

Study design and settings

A cross sectional descriptive observational study was done on 440 Type II Diabetes mellitus patients attending the outpatient department in Rural Health Training Centre (RHTC), Pullipakkam attached to a tertiary care institute. This RHTC was the main health care center in the area catering to the basic medical needs of the study population. Hence the details of all diagnosed Type II DM patients were recorded in the RHTC. This cohort was also established for future follow up. Universal-sampling was used. All the 440 DM patients attending the RHTC in the area were enrolled in the cohort from January to December 2019. Baseline data was collected during their time of visit to the RHTC. All Type II diabetic patients irrespective of age were included in the study. Those subjects who were not inclined to participate or not giving informed consent were excluded.

Data collection

The study techniques included interview through a structured questionnaire and baseline general examination for anthropometric variables including weight and height. WHO classification of BMI (Body Mass Index) was used. After explaining in detail, the objectives and the procedure, the study participants were administered a questionnaire through interview in local language (Tamil) containing two parts.

A. The first part collected their baseline socio-demographic details and clinical history.
B. The second part was the main study tool.

Presence of depression and its severity was determined using Patient Health Questionnaire (PHQ) -9 Depression scale (20, 21). It has 9 questions with 4 responses for each question.

Depending on the response, the patient scored

I. "0" for "Not at all"
II. "1" for "several days"
III. "2" for "more than half the day" and
IV. "3" for "nearly every day".

The maximum that could be scored was 27 while the minimum that could be scored was 0. A score of 5 and above constituted a diagnosis of Depression. Depression was categorized as

1. Mild (5-9),
2. Moderate (10-14) and
3. Severe (15-27) based on their responses.

The Tamil version of the questionnaire was used in the present study(22). It is an open-source document available freely for academic and research purposes.

Ethical considerations

Institutional Ethics committee (73/2017) approval was obtained before study participant recruitment. All the eligible people were explained about the study and their queries were answered to their satisfaction. An informed consent was obtained from all the willing participants, and a copy of the signed consent was handed over to the participant. Illiterates (who cannot read and write but can understand) along with their family members were explained about the study and if willing, were asked to place their left thumb impression on the consent form. The details of the participants and the data obtained from them were kept confidential throughout the study.

Statistical analysis

Data Entry and Analysis was done using SPSS-20.0 software. Prevalence of depression assessed with PHQ-9 questionnaire, was the primary outcome variable. Explanatory variables included baseline socio-demographic characteristics, anthropometric characteristics, Clinical history about Type II DM and its duration. The data was summarized by descriptive statistics. Qualitative variables were expressed as proportions with 95% Confidence Intervals (C.I.). Quantitative variables were expressed as Mean ± S.D. The descriptive component was used to estimate the Depression prevalence. Chi-square test was utilised to test the association between various risk factors and depression in Type II DM. A p value of <0.05 was considered as the level for achieving statistical significance.

RESULTS

A total of 440 subjects were included. Majority (60%) were females. 41.9% were aged more than 60 years. Majority (67.7%) were from nuclear families and had educational status of secondary school or above (49.1%), were overweight or obese (61.8%). The duration of diabetes varied from 6 to 10 years in 27.3% of the subjects to more than 15 years in 25.4% of the subjects. (Table 1).

Table 1: Baseline profile of the study population (n=440)

Variables	Frequency (N)	Proportion (%)
Age in years		
≤30	8	1.8
31-40	64	14.5
41-50	64	14.5
51- 60	120	27.3
>60	184	41.9
Type of family		
Nuclear	298	67.7
Joint	82	18.6
Extended	60	13.7
Education		
Illiterate	10	2.3
Primary	86	19.5
Middle	128	29.1
Secondary	96	21.8
Graduate	88	20.0
Postgraduate	32	7.3
BMI in kg/m^2		
<18.5	8	1.8
18.5-24.99	160	36.4
25-29.99	144	32.7
>30	128	29.1
Duration of diabetes in years		
≤1	80	18.2
2-5	96	21.8
6-10	120	27.3
11-15	32	7.3
>15	112	25.4

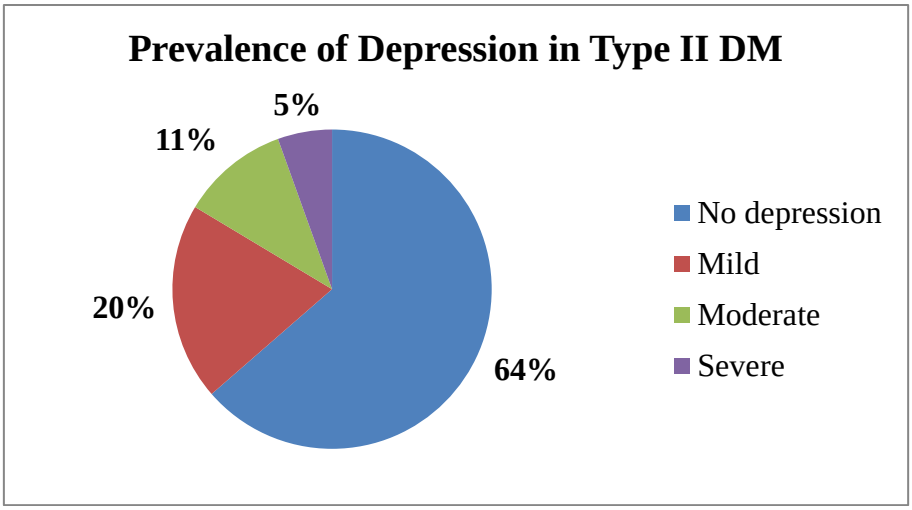

Fig. 1: Prevalence of depression in Type II DM (n=440)

Table 2: Association of depression with age, gender, BMI, type of family, education, and duration of diabetes

Variables	Depression (n=160)	No depression (n=280)	Chi square value	p value
Age(years)				
<40	32 (44.44%)	40 (55.56%)	22.283	<0.001
41-50	8 (12.5%)	56 (87.5%)		
51-60	40 (33.33%)	80 (66.67%)		
>61	80 (43.48%)	104 (56.52%)		
Gender				
Male	48 (26.67%)	132 (73.33%)	12.378	<0.001
Female	112 (43.08%)	148 (56.92%)		
BMI (kg/m^2)				
<18.5	8 (100%)	0	4.428	0.035
18.5-24.99	36 (22.5%)	124 (77.5%)		
25-29.99	56 (38.89%)	88 (61.11%)		
>30	60 (46.88%)	68 (53.13%)		
Type of family				
Nuclear (n=298)	124 (41.61%)	174 (58.39%)	17.472	<0.001
Joint (n=82)	28 (34.15%)	54 (65.85%)		
Extended (n=60)	8 (13.33%)	52 (86.67%)		
Education				
Illiterate (n=10)	8 (80%)	2 (20%)	20.271	0.001
Primary (n=86)	38 (44.19%)	48 (55.81%)		
Middle (n=128)	48 (37.5%)	80 (62.5%)		
Secondary (n=96)	36 (37.5%)	60 (62.5%)		
Graduate (n=88)	26 (29.55%)	62 (70.45%)		
Postgraduate (n=32)	4 (12.5%)	28 (87.5%)		
Duration of DM in years				
≤1 (n=80)	47 (58.75%)	33 (41.25%)	29.950	<0.001
2 to 5 (n=96)	35 (36.46%)	61 (63.54%)		
6 to 10 (n=120)	25 (20.83%)	95 (79.17%)		
11 to 15 (n=32)	11 (34.38%)	21 (65.63%)		
>15 (n=112)	42 (37.5%)	70 (62.5%)		

Table 2 describes the association of depression with age, gender, BMI, type of family, education, and duration of diabetes. Depression was seen more among participants aged <40 years 32(44.4%) followed by>60 years of age 80(43.5%). Alarmingly females 112(42.4%) were more affected than males. People who were undernourished 8(100%), living in a nuclear family 124 (41.6%), illiterates 8(80%) and newly diagnosed diabetes 47(57.5%) had statistically significant association with depression.

DISCUSSION

Type II DM is a chronic disease-causing significant morbidity and mortality. In the present study the overall prevalence of Depression in Type II DM was 36.36% with 95% C.I. of 31.86% to 41.05%. Depression was more common among females (p=0.022), subjects who were under weight (p=0.035), living in nuclear family (p=0.004), illiterate (0.006), newly diagnosed (<1 year from

diagnosis) with diabetes (0.0183) in the present study.

Diabetes Mellitus is a prominent Non-Communicable Disease (NCD), affecting the low- and middle-income countries. The psychological effect of Type II DM is profound ranging from Diabetes distress to major depressive disorders, bipolar disorders, stress related disorders to other psychotic disorders (23). It results on impairment of their quality of life. Most of the patients are diagnosed to have diabetes mainly during routine checkup. Hence, there is an increased risk of having diabetic complications by the time of diagnosis itself**.** Nearly half of the people with DM do not know they have diabetes (24). According to WHO, Depression is the second leading cause of disability globally, accounting for 15% of the disease burden in the world, estimated to affect 340 million people across the world(25). Prevalence of Depression is almost double in Diabetics when compared to normal individuals (26). The diagnosis of diabetes itself is a major stressor and it imposes burden on the psychological health of the patient. When a person is first diagnosed with DM, they may go through various psychological stages- disbelief, denial, anger, and depression. They are burdened with lot of issues such as medications/insulin, economic stress, employment concerns, personal relationships, dietary restrictions, exercise requirements, poor sleep etc.

The overall prevalence of depression in Type II DM in the present study was 36.36%. It was comparable (39.7%) with the study done in Kancheepuram by Anantha *et al.,* (6). Their study population and characteristics were like that of our study. They did their study on 300 Type II DM subjects attending an Urban Health Training Centre (UHTC) in Tamil Nadu. The global prevalence of depression is two times higher in Type II DM (19.1% Vs 10.7%) when compared to the general population (4). It was reported as 20% according DIADEMA Study in Spain (5), which was lower than our study. This difference could be due to cultural and social factors across countries and the level of awareness among the people. The prevalence of severe depression was 14.3% in the study by Joseph et al., (27). It was higher than our study (5%) and this difference could be due to the difference in socio-demographic and cultural characteristics across the population. Other studies also reported the prevalence of severe depression around 20%, but they were mostly hospital based studies (28, 29).

In the first year after initiating oral anti-diabetic treatment, the incidence rate of depression in Type II DM was 12.6 per 1000 person-years in the study by Lunghi *et al.,* (7). This rate was higher compared to the population with longer duration of DM. Similarly, in the present study, that newly diagnosed diabetes, i.e., <1 year from diagnosis (57.5%) had statistically significant association with depression compared to those with DM for longer duration. The overall relative risk for incident depression associated with diabetes at baseline was 1.15 with 95% CI 1.02 to 1.3 in the meta-analysis by Mezuk *et al.,* (8). In their meta-analysis, there was there was a 60% increased risk of type 2 DM in subjects with depression, but on comparison there was only modest increase in depression risk in subjects with type II DM. In the present study, depression was more common among female gender, subjects who were under weight, living in nuclear family, illiterate and newly diagnosed with diabetes. These findings were like the study done by Joseph *et al.,* (27) in an urban population in Mangalore, South India. They also reported that the proportion of depression in Type II DM was significantly higher among female subjects, obese/overweight subjects, subjects from lower/middle socio-economic status, subjects with older age and with co-morbid conditions/ complications. Other studies have also reported a higher prevalence of depression in females with Type II DM compared to males (29). It could be due to the heavy household burden in women in India besides the effect of estrogen levels. There was a significant association between educational status and depression in Type II DM in our study similar to other reported studies(29). In the present study, 2.3% were illiterates. Majority (48.6%) had education only up to middle school. A few studies have established a significant association between depression in DM and overweight/obesity (27). It could be due to the low self-esteem and psychological, social problems associated with obesity. But in the present study, being underweight was associated with depression. Some studies have also noted no association between BMI and depression in Type II DM (29). Oral Hypoglycemic agents can reduce the need of insulin requirement in obese people besides aiding in weight reduction. But in underweight subjects, there is a need for insulin shots for glycemic control, further contributing to anxiety and depression. Being diagnosed with a chronic disease may affect the mental status in those newly diagnosed with DM, whereas among elderly, the chronicity of the disease, progression of the disease leading to complications, and dependency on family members or caretakers might be the reasons for development of depression. Lack of availability of necessary physical, mental emotional support from the family members could be the factor determining depression in patients belonging to nuclear family.

Limitations

The present study was only a cross sectional study. The causal association cannot be established from this study. With follow up planned for the next 4 years, this limitation can be removed. The association

could be bi-directional. Only a certain group of risk factors could be studied due to practical constraints.

CONCLUSION

The present study has established that a higher proportion of people with T2DM suffer from depression (39.7%). It has also identified certain factors associated with depression such as female gender (p=0.022), being under weight (p=0.035), living in nuclear family (p=0.004), being illiterate (0.006), newly diagnosed (<1 year from diagnosis) with diabetes (0.0183) as risk factors for depression in Type II DM. Depression in a patient with DM negatively affects their quality of life, their treatment outcome and their adherence to treatment. Long standing diabetics are more prone for development of complications. Depression further increases the risk and makes the management more difficult. Early identification of Depression is necessary to improve the quality of life in this group of subjects.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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