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Prevalence of Depression among Patients with Type 2 Diabetes Mellitus and its associated Clinical Factors

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Abstract

Introduction. Type 2 diabetes mellitus has been linked to depression. However, this has been largely unrecognized and untreated. There are no current data available in the Philippine setting of the prevalence of the disease.

Objective. The objective of the study was to determine the prevalence of depression among adult Filipino patients with type 2 diabetes mellitus and investigate the different clinical factors associated with it.

Methodology. This is a single-center, analytic cross-sectional study conducted at a tertiary hospital, with 476 patients aged above 18 years old diagnosed with type 2 Diabetes Mellitus included. The Physicians Health Questionnaire 9 (PHQ-9) with a score of >5 was used to make a diagnosis of depression.

Results. Prevalence of depression among patients with type 2 diabetes mellitus was 19.9%. Factors associated with increased odds of depression were having a post-graduate degree (*p-value*=0.012), presence of retinopathy (*p-value*=0.018), and higher MMA Score (lower adherence) (*p-value*=0.000).

Conclusion. Depression is prevalent among Filipino patients with type 2 diabetes mellitus. An integrated approach by the attending physicians and psychiatrists is required for the effective management of these patients.

Key words: depression, type 2 diabetes mellitus, Filipino, Philippines

INTRODUCTION

Depression is a common public health issue which affects all aspect of a person's life and has been recognized as an important co-morbid condition in diabetes and diabetes related complications.[1] People with diabetes are almost twice as likely to suffer from depression and anxiety as the general population. But this factor remains unrecognized and thus untreated.[2] Many studies have documented the high rate of depression found among patients with diabetes, compared with non-patient control subjects.[2,3,4] However, minimal data had been gathered of the prevalence of it here in the Philippines.

In China, the prevalence of depression among patients with diabetes was 5.7%. Higher body mass index (BMI) score, high glycosylated hemoglobin (HbA1c) level and low health quality insurance were associated with presence of depression.[5] According to the study of Al et al., there was also increased prevalence of depression among Jordanians with diabetes which was associated with gender (female), socioeconomic status and insulin therapy.[4] In the Mexican American population, 25% presented with minor depression and 9% with lifetime diagnosis of major depressive disorder. Greater incidence of both macro- and microvascular complications and greater incidence of disability in activities of daily living were seen among depressed depressed persons with diabetes.[6] Several factors were correlated with depression in type 2 diabetes, such as low levels of education, physical inactivity, subjective somatic complaints, and physical impairment.[7] However, there has some inconsistencies of the associations between depression and HbA1C.[5,7]

The purpose of this study was to determine the prevalence of depression and its associated clinical factors among patients with type 2 diabetes mellitus seen at a tertiary hospital in the Philippines.

METHODOLOGY

This was an analytic cross- sectional study that was conducted to determine the prevalence of depression and associated factors in patients with type 2 diabetes in St. Luke's Medical Center from May 2018 to December 2018. Inclusion criteria of the study were diagnosed with type 2 Diabetes mellitus fulfilling criteria of American Diabetes Association (FBS >126, HbA1c >6.5, symptoms with RBS>200 mg/dl); age >18 years old; and able to read and understand the English questionnaire.

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The exclusion criteria were patients with type 1 diabetes mellitus, with history of severe hypertension (HTN >160 mmHg); those clinically diagnosed with Bipolar disorders, Schizophrenia, Dementia, Anxiety Disorder, Mental retardation as reported by their attending physician; Drug or Alcohol addicts; Patients who had major life events like death of a loved one and job lost; and having diabetic ketoacidosis.

A letter of invitation to participate was disseminated to endocrinology consultants, endocrinology fellows and internal medicine residents of St. Luke's Medical Center Quezon City. The attending physicians referred their patients to the investigator who passed the inclusion criteria of the study. Informed consent was obtained prior to collection of data.

The 30-minute interview and examination were conducted at a room at the Diabetes, Thyroid and Endocrine Center of St. Luke's Medical Center-Quezon City to ensure privacy. Data on socio-demographic characteristics (age, gender, civil status, education, and occupation), diabetes history (duration, insulin therapy, chronic complications, glycemic control as HbA1c on the past 3 months), number of concomitant medication, BMI (body mass index — kg/m^2), previous episodes of depression, treatment with antidepressant drugs and family history of depression were collected.

The questionnaires were administered by the primary investigator trained by a psychiatrist. The participants were provided 2 questionnaires. Depressive symptoms were assessed with Patient Health Questionnaire-9 (PHQ-9). It is a screening tool which incorporates diagnostic criteria with other leading major depressive symptoms into a brief self-report tool. The tool rates the frequency of the symptoms which factors into the scoring severity index. The total score can range from 0 to 27, with higher scores indicating greater severity of depression. A score of 0-4 is none to minimal depression requiring no treatment. A score of more than or equal to 5 makes a diagnosis of depression. A score of 5-9 is mild, 10-14 is moderate, 15-19 is moderately severe and 20-27 is severe depression, all requiring treatment. PHQ scores of more than 10 had sensitivity of 88% and specificity of 88% for major depression.[8] Compliance to diabetes medications were assessed with the eight-item version of the Morisky Medication Adherence Scale (MMAS).[9] The questionnaires have been validated among Filipinos.[10] These were interpreted by a psychiatrist. The results were then forwarded to the attending physicians and psychiatric consult were discussed.

Description of outcome measures

The primary outcome of the study was the prevalence rate of depression among patients diagnosed with Type 2 Diabetes Mellitus using the PHQ-9.

Secondary outcomes determined the severity of depression, medication adherence and association of BMI, duration of diabetes, compliance with medications, type of medications (OADs versus insulin therapy), number of medications (single or multiple drug therapy) socioeconomic status and other comorbid diseases (hypertension, dyslipidemia, ischemic heart disease) with depression.

Sample size estimation

Minimum needed sample size for logistic regression analysis was computed using G*power 3.0.10 software.[11] Based on expected medium effect size (r^2 =15%), 95% confidence interval, 90% power, and 20 independent variables (sociodemographic and clinical variables) the minimum needed sample size was 191.

Data analysis

The socio-demographic and clinical characteristics were summarized using means and standard deviations for continuous data and frequencies and percentages for categorical data. Pearson chi-square and Fisher's exact tests were used to determine if the distribution of levels of depression significantly differed per category of each variable. Multiple logistic regression analysis was used to evaluate the relationship between different variables and presence of depression among patients with type 2 diabetes mellitus. *P-values* less than 0.05 was used and confidence level was set at 95%. All variables that have *p-value*<0.10 during univariate tests of association were included in the multiple logistic regression analysis. STATA 14 was used for data analysis.

Ethical considerations

The Clinical Protocol and all relevant documents were reviewed and approved by the SLMC Institutional Ethics Review Committee. Upon the referral from the attending physicians, the significance of study was explained and an informed consent was sought by the primary investigator. Patient's autonomy and confidentiality were respected. Data were coded and identification anonymized. All data were recorded and investigators were responsible for the integrity of the data i.e., accuracy, completeness, legibility, etc. Results were disseminated to the attending physician with the approval of the patient. The manner of disseminating and communicating the study results guaranteed the protection of the confidentiality of patient's data. The data will be kept by the investigator until 5 years from the end of the study. Data gathered will be discarded after 5 years.

RESULTS

Table 1 describes the characteristics of the 476 patients included in this study. The mean age was 58.3 (SD=11.8) and majority were female (63.5%). Majority were also married (75.2%) and were college or vocational course graduates (69.1%). Almost half of them were employed (45.6%). The mean BMI of the patients was 26.7 (SD=4.9). More than half of them were also obese (59.7%).

In terms diabetes duration, more than half had the disease for more than 5 years already (59.6%). Their mean HbA1c value was 7.4 (SD=1.6) with almost half having uncontrolled diabetes (56.0%). The most prevalent complication experienced by the patients was neuropathy (42.4%) followed by retinopathy (28.8%) and nephropathy (26.7%). The most commonly used medication was a

Table 1. Characteristics of patients with type 2 diabetes mellitus

Variable	N=476 (%)
Age (Mean±SD)	58.3±11.8
Gender	
Male	174 (36.5)
Female	302 (63.5)
Marital Status	
Never married	73 (15.3)
Married	358 (75.2)
Widowed	45 (9.5)
Educational Status	
Elementary	28 (5.9)
High School	91 (19.1)
College/Vocational	329 (69.1)
Post graduate	28 (5.9)
Occupation/Employment	
Not employed	259 (54.4)
Employed	217 (45.6)
BMI (Mean±SD)	26.7±4.9
BMI category	
Underweight	12 (2.5)
Normal	89 (18.7)
Overweight	91 (19.1)
Obese	284 (59.7)
Duration of Diabetes	
<1 year	37 (7.8)
1-5 years	155 (32.6)
6-10 years	106 (22.3)
>10 years	177 (37.3)
HbA1c (Mean±SD)	7.4±1.6
DM control	
Controlled	187 (44.0)
Uncontrolled	238 (56.0)
Complications	
Retinopathy	137 (28.8)
Nephropathy	127 (26.7)
Neuropathy	202 (42.4)
Stroke	42 (8.8)
CAD	49 (10.3)
PAOD	29 (6.1)
Medications	
Insulin	148 (31.2)
Biguanides	346 (72.7)
Sulfonylureas	122 (25.7)
DPP-IV inhibitors	178 (37.4)
SGLT-2 inhibitors	119 (25.0)
GLP-1 agonist	1 (0.2)
TZD	51 (10.7)
Comorbidities	
Hypertension	296 (62.2)
Dyslipidemia	247 (52.1)
Hyperuricemia	19 (4.0)
Hypothyroidism	20 (4.2)
MMAS	
Low	153 (32.1)
Medium	145 (30.5)
High	178 (37.4)

BMI, Body Mass Index; HbA1c, glycosylated hemoglobin; DM, Diabetes Mellitus; MMAS, Morisky Medication Adherence Scale

biguanide (72.7%), followed by DPP-IV inhibitors (37.4%), and then insulin (31.2%). In terms of their comorbidities, 62.2% had hypertension and 52.1% had dyslipidemia. It was also observed that only 37.4% had good compliance with regards to their medications.

Table 2 describes the prevalence of depression among the patients with type 2 diabetes mellitus included in the study. The mean PHQ score was 2.6 (SD=3.4). More than half of the patients had none to minimal depression (81.1%). A PHQ score of more than five denotes depression. There was a prevalence of depression of 19.9 %, with mild depression at 12.6%. Moderate depression was reported

Table 2. Prevalence of depression and PHQ scores among patients with type 2 diabetes mellitus

Variable	N=476 (%)
PHQ scores (Mean±SD)	2.6±3.4
Depression Severity	
None to Minimal	386 (81.1)
Mild	60 (12.6)
Moderate	24 (5.0)
Moderately Severe	6 (1.3)
Severe	0 (0.0)

PHQ, Patient Health Questionnaire

by 5.0% of the patients and 1.3% had moderately severe depression. None have severe depression.

Table 3 describes the prevalence of depression disaggregated per socioeconomic and clinical characteristics of the patient. Only gender, BMI, DM control, presence of neuropathy as complication, and level of medication adherence, had significant differences in terms of distribution of levels of depression (All *p-values*<0.05). Females had higher prevalence of mild depression (15.9%) and moderate to moderately severe depression (6.9%) compared to males. The prevalence of none/minimal and mild depression was 77.2% and 17.3% among those with neuropathy. In terms of BMI, moderate to moderately severe depression was highest among those with normal BMI (25.0%) and lowest among obese (4.2%). In terms of DM control, the prevalence of none/minimal (85.3%) depression was higher among those with controlled DM and the prevalence of moderate to moderately severe was higher among those with uncontrolled DM (7.5%). In terms of medication adherence, the prevalence of none/minimal (90.4%) depression was highest among those with high adherence and the prevalence of moderate to moderately severe was highest among those with low adherence (10.5%).

Table 4 shows that results of the univariate logistic regression analysis on the association of socioeconomic status and clinical factors with depression among patients with type 2 diabetes mellitus. It can be seen that increasing age (*p-value*=0.001), hypertension (*p-value*=0.015), having diabetes for 6-10 years (*p-value*=0.027) and medium/high medication adherence (*p-value*=0.005 and 0.000, respectively) were significantly associated with decreased odds for depression. On the other hand, being female (*p-value*=0.012), having a post-graduate degree (*p-value*=0.020), being underweight (*p-value*=0.022), higher HbA1c (*p-value*=0.002), uncontrolled diabetes (*p-value*=0.017), presence of retinopathy (*p-value*=0.026), and higher MMA Score (lower adherence) (*p-value*=0.000) were significantly associated with increased odds for depression.

Table 5 shows that results of the multiple logistic regression analysis on the association of socioeconomic status and clinical factors with depression among patients with type 2 diabetes mellitus (R2 value=21.20). It can be seen that increasing age (*p-value*=0.021) and chronic duration of diabetes (6-10 years) (0.033) were significantly associated with decreased odds for depression. On the other hand, having a post-graduate degree (*p-value*=0.012), presence of retinopathy (*p-value*=0.018), and higher MMA Score (lower adherence) (*p-value*=0.000) were significantly associated with increased odds for depression.

Table 3. PHQ score and severity of depression among patients with type 2 diabetes mellitus

Variable	None to Minimal	Mild	Moderate to Moderately Severe	*p*-value
Gender				
Male	153 (87.9)	12 (6.9)	9 (5.2)	0.008*
Female	233 (77.2)	48 (15.9)	21 (6.9)	
Marital Status				
Never married	54 (74.0)	11 (15.0)	8 (11.0)	0.142
Married	298 (83.2)	40 (11.2)	20 (5.6)	
Widowed	34 (75.6)	9 (20.0)	2 (4.4)	
Educational Status				
Elementary	27 (96.4)	1 (3.6)	0 (0.0)	0.072
High School	70 (76.9)	13 (14.3)	8 (8.8)	
College/Vocational	271 (82.4)	39 (11.9)	19 (5.8)	
Post graduate	18 (64.3)	7 (25.0)	3 (10.7)	
Employment				
Not employed	217 (83.8)	29 (11.2)	13 (5.0)	0.236
Employed	169 (77.9)	31 (14.3)	17 (7.8)	
BMI category				
Underweight	76 (85.4)	5 (5.6)	8 (9.0)	0.012*
Normal	7 (58.3)	2 (16.7)	3 (25.0)	
Overweight	69 (75.8)	15 (16.5)	7 (7.7)	
Obese	234 (82.4)	38 (13.4)	12 (4.2)	
Duration of Diabetes				
<1 year	27 (73.0)	7 (18.9)	3 (8.1)	0.509
1-5 years	122 (78.7)	23 (14.8)	10 (6.4)	
6-10 years	92 (86.8)	10 (9.4)	4 (3.8)	
>10 years	144 (81.4)	20 (11.3)	13 (7.3)	
DM control				
Controlled	203 (85.3)	21 (8.8)	14 (5.9)	0.035*
Uncontrolled	142 (75.9)	31 (16.6)	14 (7.5)	
Complications				
Retinopathy	103 (75.2)	25 (18.2)	9 (6.6)	0.058
Nephropathy	98 (77.2)	23 (18.1)	6 (4.7)	0.075
Neuropathy	156 (77.2)	35 (17.3)	11 (5.5)	0.026*
Stroke	34 (80.9)	7 (16.7)	1 (2.4)	0.433
CAD	43 (87.8)	5 (10.2)	1 (2.0)	0.447
PAOD	24 (82.8)	3 (10.3)	2 (6.9)	1.000
Number of Medications				
0	16 (88.9)	2 (11.1)	0 (0.0)	0.678
1-2	246 (81.2)	35 (11.5)	22 (7.3)	
3 or more	124 (80.0)	23 (14.8)	8 (52)	
Comorbidities				
Hypertension	248 (83.8)	34 (11.5)	14 (4.7)	0.103
Dyslipidemia	208 (84.2)	23 (9.3)	16 (6.5)	0.073
Hyperuricemia	18 (94.7)	0 (0.0)	1 (5.3)	0.245
Hypothyroidism	16 (80.0)	2 (10.0)	2 (10.0)	0.673
Morisky Medication Adherence				
Low	102 (66.7)	35 (22.9)	16 (10.5)	0.000*
Medium	123 (84.8)	14 (9.7)	8 (5.5)	
High	161 (90.4)	11 (6.2)	6 (3.4)	

BMI, Body Mass Index; DM, Diabetes Mellitus; CAD, Coronary Artery Disease; PAOD, Peripheral Arterial Occlusive Disease
* Significant at 0.05 level

DISCUSSION

In a survey conducted by Perlas, Tronco et al., in the Philippines, about 5.3 percent of Filipinos with chronic illness were suffering from depression.[12] In the study of Dy Nieva et al., 31% of patients with type 2 diabetes mellitus had depression, with 24% as mild, and 7% had moderate depression.[13] In our study, the prevalence of depression among patients with diabetes mellitus in the Philippines was lower at 18.2%, with mild depression at 13% and moderate depression at 5.2%. Unlike the study of Dy Nieva et al.,[13] our sample size was larger.

The prevalence result of our study was lower than Varma et al. (49.48%),[14] Al Ghamdi (34%),[15] Sweileh et al. (40%),[16] Salinero- Fort et al. (20.03 %),[17] and Rodriguez Calvin (32.7),[18] but higher than the study of Zhang in China (5.7%).[5]

The prevalence of moderate to severe depression in our study was 6.3%. This was lower in comparison with the Mexican American population which 25% presented with minor depression and 9% with lifetime diagnosis of major depressive disorder.[6] In the study of Varma et al., in India, their prevalence of depression in patients with Type 2 diabetes mellitus was 49.5%, with those having severe depression at 7.16%.[14]

Inconsistent with other studies, female gender did not increase the risk of depression.[14,16-17] Being single, including being unmarried, widowed, and divorced, was identified as a risk factor according to the study of Zhang,[5] however, in our study the marital status was not a significant factor. Having higher educational degree, increases depression, which were in contrast with the results of the other studies.[16]

Different from other studies,[5,14] the number of medications and type of medication, whether oral antidiabetic medications or insulin, did not increase the risk of depression. Furthermore, in contrast with the study of

Table 4. Univariate logistic regression analysis on the association of socioeconomic status and clinical factors with depression among patients with type 2 diabetes mellitus

Variable	Odds Ratio	95% CI	p-value
Age (Mean±SD)	0.964	0.944 - 0.984	0.001*
Gender			
Male	Ref		
Female	2.102	1.179-3.749	0.012*
Marital Status			
Never married	Ref		
Married	0.538	0.286-1.015	0.055
Widowed	1.018	0.416-2.491	0.969
Educational Status			
Elementary	Ref		
High School	2.657	0.847-52.312	0.071
College/ Vocational	4.278	0.567-32.267	0.159
Post graduate	12.789	1.493-109.544	0.020*
Employment			
Not employed	Ref		
Employed	1.273	0.773-2.097	0.343
BMI	0.952	0.900-1.007	0.090
BMI category			
Normal	Ref		
Underweight	4.583	1.250-16.799	0.022*
Overweight	1.925	0.883-4.120	0.100
Obese	0.902	0.446-1.823	0.774
Duration of Diabetes			
<1 year	Ref		
1-5 years	0.423	0.179-0.999	0.050*
6-10 years	0.345	0.134-0.884	0.027*
>10 years	0.551	0.241-1.257	0.157
HbA1c (Mean±SD)	1.269	1.093-1.372	0.002*
DM control			
Controlled	Ref		
Uncontrolled	1.928	1.125-3.303	0.017*
Complications			
Retinopathy	1.800	1.027-3.022	0.026*
Nephropathy	1.131	0.651-1.967	0.661
Neuropathy	1.582	0.959-2.610	0.072
Stroke	0.557	0.192-1.610	0.280
CAD	0.333	0.101-1.099	0.071
PAOD	0.876	0.296-2.597	0.812
Number of Medications	1.119	0.900-1.392	0.309
Medications			
Insulin	1.363	0.810-2.294	0.244
Biguanides	0.849	0.491-1.466	0.556
Sulfonylureas	1.021	0.578-1.804	0.942
DPP-IV inhibitors	0.979	0.584-1.641	0.937
SGLT-2 inhibitors	1.471	0.853-2.535	0.165
TZD	1.209	0.561-2.604	0.628
Comorbidities			
Hypertension	0.535	0.324-0.884	0.015*
Dyslipidemia	0.675	0.409-1.116	0.125
Hyperuricemia	0.297	0.039-2.260	0.241
Hypothyroidism	1.402	0.455-4.320	0.556
Morisky Medication Adherence			
Low	Ref		
Medium	0.426	0.233-0.778	0.005*
High	0.241	0.125-0.464	0.000*
Morisky Medication Adherence Score	1.418	1.245-1.614	<0.001*

BMI, Body Mass Index; DM, Diabetes Mellitus; CAD, Coronary Artery Disease; PAOD, Peripheral Arterial Occlusive Disease
* Significant at 0.05 level

Table 5. Multiple logistic regression analysis on the association of socioeconomic status and clinical factors with depression among patients with type 2 diabetes mellitus

Variable	Odds Ratio	95% CI	*p*-value
Age	0.962	0.932-0.994	0.021*
Gender			
Male	Ref		
Female	2.011	0.999-4.051	0.050*
Marital Status			
Never married	Ref		
Married	0.806	0.350	1.854
Widowed	1.906	0.551	6.590
Educational Status			
Elementary	Ref		
High School	4.809	0.534-43.289	0.161
College/Vocational	5.054	0.595-42.909	0.138
Post graduate	19.683	1.938-199.922	0.012*
BMI	0.948	0.885-1.016	0.132
Duration of Diabetes			
<1 year	Ref		
1-5 years	0.428	0.146-1.254	0.122
6-10 years	0.267	0.079-0.899	0.033*
>10 years	0.601	0.200-1.811	0.366
HbA1c	1.130	0.881-1.450	0.336
DM control			
Controlled	Ref		
Uncontrolled	1.444	0.591-3.523	0.420
Retinopathy			
None	Ref		
Yes	2.361	1.158-4.813	0.018*
Neuropathy			
None	Ref		
Yes	1.606	0.836-3.083	0.155
CAD			
None	Ref		
Yes	0.483	0.129-1.814	0.281
Hypertension			
None	Ref		
Yes	0.703	0.355-1.395	0.314
Morisky Medication Adherence Score	1.458	1.240-1.714	0.000*

BMI, Body Mass Index; DM, Diabetes Mellitus; CAD, Coronary Artery Disease
* Significant at 0.05 level

Zhang,[5] Sweileh[16] and Dy Nieva,[13] which revealed higher BMI had association with depression, weight was not a factor for depression in our study.

Diabetic complications were found to be strongly associated with increasing depression.[6,14] Other studies showed depression was associated with neuropathy[17] but in our study, retinopathy was the connected complication. Blurring of vision or visual abnormalities are noticeable symptoms which may add to the stress of the patient and affect their activities of daily living.

As seen with the study of Sweileh et al.,[16] low medication adherence revealed to be associated with depression. Patients with poor glycemic control have greater risk of experiencing depression than those who have good control as seen in our study. Several studies have confirmed this association.[14,18] When T2DM and depression co-exist in an individual, he/she is more prone to develop worse glycemic control due to poorer medication adherence, which could lead to diabetic complications and associated morbidity.

Based from other reviews, there is a biological basis of depression and type 2 diabetes mellitus. Depression is associated with subclinical hypercortisolism secondary to hypothalamic-pituitary adrenal (HPA) axis activation.[19-20] Cortisol also activates lipolysis and release of free fatty acids, which can induce insulin resistance. Repeated stress with the repeated induction of corticosteroids can result in hippocampal damage, causing a failure in the downregulation of corticosteroid production by the feedback mechanism and thus persisting elevated

circulating cortisol levels.[21,22] In the study of Gold et al., individuals with type 2 diabetes have clear deficits in hippocampal-based (recent or declarative) memory and selective MRI-based atrophy of the hippocampus relative to matched control subjects.[23] These may provide an additional explanatory link between depression and type 2 diabetes.

Metabolic disturbances of diabetes also lead to changes in the brain that alter susceptibility to social stressors. It induces changes in neuronal function and structure on areas of the brain that regulate affect and, therefore, increase risk for depression.[24]

It was also noted that inflammation is also present on both diabetes mellitus and depression. A study by Brummett et al.,[25] found depression to be associated with higher inflammatory markers (CRP and IL-6), and interestingly the association was stronger in women compared with men. Both depression and diabetes are associated with enhanced cytokine production and elevation of inflammatory markers which may be another biological mechanism through which these two disorders are related.[19,22] Catecholamines and inflammatory cytokines are known to induce insulin resistance.[19,26] Features of type 2 diabetes, such as fatigue, sleep disturbance, and depression, are likely to be at least partly due to hypercytokinemia and activated innate immunity.[21]

It is beyond the scope of the study to investigate further the biological basis of depression among diabetes mellitus. In this study, the associated clinical risk factors for depression were: being employed, having low medication adherence and poorly controlled diabetes mellitus and, the presence of retinopathy.

Limitations of the study

Our study investigated the prevalence and associated factors of depression in patients with type 2 diabetes mellitus in the Philippines. However, our study has few limitations: (1) Consecutive sampling was done to recruit participants, (2) samples were recruited from 1 hospital only and are not representative of the subsets of patients in the Philippines, (3) complications of diabetes were noted per chart review and as reported by the subjects only, (4) this study is cross-sectional where causal relationship between diabetes and depression cannot be established.

CONCLUSION

Depression is prevalent among Filipino patients with Type 2 Diabetes Mellitus. About two out of five patients (19.9%) with diabetes mellitus have depression. Low medication adherence, having a postgraduate degree and presence of retinopathy as complication, were significantly associated with depression. These findings support a recommendation for routine screening and regular psychosocial assessment for depression among Filipino patients with diabetes. Integrated approach by the attending physicians and psychiatrists may be required for the effective management of these patients.

Statement of Authorship
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