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Correlates of Undiagnosed Depression among Diabetic Patients on Follow-Up at a Regional Referral Hospital in Western Kenya

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Abstract

The prevalence of diabetes mellitus in Kenya is estimated to be 4.66%. The comorbidity of diabetes and depression is associated with poor outcomes. The study aimed at determining the prevalence and factors associated with depression among diabetics. A cross-sectional survey was conducted among 181 diabetics attending clinic at a referral hospital in western Kenya. A questionnaire was used to collect data on the independent variables. Beck's Depression Inventory (BDI-II) was used to assess depression symptoms.

Depression was observed in 19% of the participants. Female gender, being single, urban residence, low income and no family support were significantly associated with depression. Others are; longer duration of illness, difficulties adhering to treatment and alcohol consumption ($p<0.05$). A significant proportion of diabetic patients have comorbid depression. Integration of mental health services into diabetics care setting will lead to detection and early treatment of depression.

Keywords: Undiagnosed Depression, Diabetes Mellitus

Introduction

Diabetes mellitus is a major public health problem in the world. Globally,382 million people suffer from the condition(International Diabetes Federation, 2013). The figure is projected to rise to 592 million people by the year 2035. 80 % of persons with the condition live in middle to low-income countries (International Diabetes Federation, 2013). The comparative prevalence of diabetes mellitus in Kenya is estimated to be 4.66 %(International Diabetes Federation, 2012).The two types of diabetes mellitus are chronic and debilitating.

Internationally, available data shows wide variability in the prevalence rates of depression among persons with diabetes mellitus. However, there is a general agreement that the comorbidity of diabetes and depression is common. Compared to those without diabetes mellitus, persons with diabetes mellitus are up to three times as likely to develop depression(Andreoulakis, Hyphantis, Kandylis, & Iacovides, 2012). In a study done in Greece, it was reported that 33.4 % of persons with diabetes mellitus had elevated depressive symptoms(Sotiropoulos et al., 2008). In the United States of America, prevalence rates ranging from 2 % to 28 % have been reported(Li, Ford, Strine, & Mokdad, 2008). In other studies, rates of as high as 40.3 % have been reported(Niraula et al., 2013).

From studies that have been conducted in some African countries, it has been shown that the prevalence of depression in persons living with chronic conditions is quite high. In a study conducted in a Nigerian teaching hospital, it was demonstrated that 30 % of the respondents in the group with diabetes mellitus had depressive symptoms(James, Omoaregba, & Eze, 2010). From a study done in South Africa, it was reported that a sizeable proportion of participants with chronic conditions experienced symptoms of depression and anxiety(Kagee, 2008).

A number of factors have been associated with depression in persons living with diabetes mellitus. In India, It has been demonstrated that the prevalence and severity of depression is higher among females than in males(Chaudhry, Mishra, Mishra, Parminder, & Mishra, 2010). A study in Bangladesh demonstrated that both mild to moderate and severe depression were more common in females than males(Rahman, Rahman, & Flora, 2011).

The levels of income and affluence have been associated with depression and diabetes comorbidity. In Nepal, higher personal income and urban residence have been shown to be associated with more depression severity(Niraula et al., 2013). In India, however, it was reported that low income was associated with higher prevalence of depression among persons living with diabetes (Mendenhall et al., 2012).

The family structure, marital status and race or ethnicities have been associated with depression among persons with diabetes. In Pakistan, it has been reported that the nuclear family is a predictor of depression among individuals with diabetes mellitus(Perveen, Otho, Siddiqi, Hatcher, & Rafique, 2010). In Bangladesh and Pakistan, it has been reported that being single is a risk factor for depression among persons with diabetes mellitus(Rahman et al., 2011) and(Perveen et al., 2010). Race and ethnicity have been reported to be predictors of depression in the United States of America(Li et al., 2008).

Other factors that have been associated with depression and diabetes comorbidity include family history of diabetes, duration of diabetes, presence of complications and the mode of treatment. In Nepal, it was reported that family history of diabetes ,longer duration of illness and absence of diabetes complications were all associated with less depressive symptoms(Niraula et al., 2013). In a study done in Bangladesh, it was demonstrated that insulin users were more likely to develop severe depression than those that were using oral drugs(Rahman et al., 2011).

Depression in persons with diabetes has been associated with negative outcomes. In one study, depression was shown to be associated with poor adherence to the diabetes treatment regimen(Gonzalez et al., 2008). In Nepal, it was reported that high glycosylated haemoglobin was seen in patients with depression and diabetes comorbidity(Niraula et

al., 2013). From a study conducted in Nigeria, it was reported that major depressive disorder is associated with lower scores on the aspects of overall quality of life and health satisfaction(James et al., 2010).

Treatment of depression in persons with diabetes mellitus can lead to good blood sugar control and minimize complications. Lack of assessment is a barrier to effective treatment of depression in this group of people. To convince policymakers on the need to prioritize the screening of persons with diabetes for depression, data should be provided. Literature review did not reveal any studies that have been done to investigate the comorbidity of depression and diabetes in Kenya.

The objectives of this study were to determine the prevalence of and factors associated with undiagnosed depression among persons with diabetes mellitus.

Methods

The study was a cross sectional survey including 181 diabetic patients who were seen at Moi Teaching and Referral Hospital between 13th June 2014 to 11th July 2014.

The study was conducted at the diabetes clinic of the hospital. The hospital is located 310 km North West of Nairobi. The public hospital with a capacity of 800 beds is the largest referral facility in the Western Kenya region. It serves patients from Western Kenya, Uganda, Rwanda, Burundi and Southern Sudan. A number of special clinics are run at the hospital. Among these clinics is the diabetes outpatient. On average, 273 persons with diabetes are attended to in this clinic every month.

Sample size was estimated using the prevalence of depression among people with diabetes mellitus from a study conducted at a Nigerian teaching hospital(James et al., 2010). With prevalence of 30 % and at 95 % confidence interval, a sample size of 181 was determined. Clients were consecutively recruited until the desired sample size of participants was attained.

To be eligible to participate in the study, patients were required to have lived with diabetes for at least three months. This was besides being aged 18 years or more. Those with an established diagnosis of any psychiatric disorder, those with a history of psychiatric disorder, patients on psychotropic medication, pregnant women, patients with cognitive impairment and those with severe organic illness were excluded.

A semi-structured questionnaire was administered by the interviewer to collect data on socio-demographic, behavioural and disease-related characteristics. Pre-testing of the questionnaire was carried out at Kenyatta National Hospital. Beck's Depression Inventory (BDI-II) was used to assess symptoms of depression. The BDI-II has been tested and shown to be reliable with high internal consistency and good item-total intercorrelations.

All data were analyzed using STATA 11.2 (StataCorp, Inc, Texas, USA).Basic descriptive statistics were used to summarize the data. Chi-squared statistical tests were used. The relationship between the socio-demographic, disease-related, behavioural and outcome variables were examined by use of bivariate analysis models. P value < 0.05 was considered statistically significant. The prevalence of depression was established by determining the number of patients with BDI-II score >13.

Results

A total of 181 patients attending the diabetes outpatient clinic at Moi Teaching and Referral Hospital (MTRH) participated in the study.

Sociodemographic characteristics of participants

The average age of patients was 36.2 years, range 18 to 63 years with a Male-to-female ratio of approximately 1: 2. Majority of the patients, 92 % (167) were aged below 53 years. Only 8 % (14) were aged above 53 years. Most participants, 36 % (68) were aged between 27 and 35 years. 3%(5) of the study participants had no formal education,17%(30) did not complete primary education,22%(40)completed primary education,11%(20)did not complete secondary education and the rest,47%(85)had secondary education and above. Majority 61.3 %(111) of the study participants earned less than Ksh 10,000 a month. Only 11.6 %(21) earned an income of more than Ksh 50,000 a month. Majority of the study participants, 77 %(140) said they were supported by their families.23 % (41) reported lack of support from their families

Disease-related variables

Majority of the participants, 68.5 %(124) have had diabetes for between 1 and 5 years. Only one participant (.6%) has had diabetes for more than 20 years.Most participants, 69 %(125) had a diagnosis of type 1 diabetes mellitus. The rest, 31 % (56) had type 2 diabetes mellitus.Most patients, 79.6 %(144) were on injections. The others, 19.9 %(36) were on oral tablets and 0.6 %(1) was on a combination of injections and tablets.

Most of the patients 72 % (130) did not have difficulties adhering to the treatment regimen. The rest, 28 %(51) reported having difficulties with adherence to treatment.

Most participants, 48.6 % (88) monitored their plasma glucose levels occasionally. 12.2 %(22) did not monitor blood glucose at all. Most patients, 76 %(138) had one or more complications of diabetes mellitus. The rest, 24 %(43) did not have any complications of diabetes mellitus.

Only 5 %(9) were smokers while 6 %(11) were alcohol consumers.

Prevalence of depression among patients attending MTRH diabetes clinic

Most patients, 81 %(147) were not diagnosed with depression. The rest, 19 %(34) were diagnosed with depression ranging from mild (7 %, 12) to severe depression (2 %, 3).10 %(19) had moderate depression.

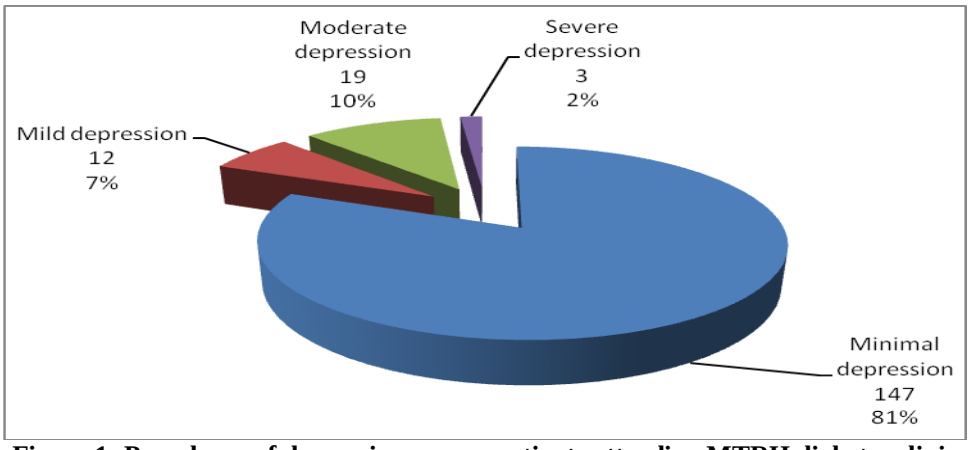

Figure 1: Prevalence of depression among patients attending MTRH diabetes clinic

Depression and sociodemographic factors

The occurrence of depression in diabetic patients was significantly associated with most sociodemographic characteristics including family support ($p<0.0001$) and gender ($p < 0.0001$).

Female patients had a higher prevalence of moderate depression, while male patients had a higher prevalence of mild depression than female patients. Single patients had a higher prevalence of moderate depression (42.9%) compared to patients in other marital states ($p <0.0001$).

Depression was more prevalent (46.3%) in patients without family support compared to their colleagues who had family support (10.7%).

Table 1: Association between sociodemographic variables and depression

VARIABLES	MINIMUM DEPRESSION	MILD DEPRESSION	MODERATE DEPRESSION	SEVERE DEPRESSION	P VALUE
Age					
18-26	29(87.9)	1(3.0)	1(3.0)	2(6.1)	0.049
27-35	63(92.6)	1(1.5)	3(4.4)	1(1.5)	0.019
36-44	21(58.3)	1(2.8)	14(38.9)	0(0.0)	<0.0001
45-53	22(73.3)	8(26.7)	0(0.0)	0(0.0)	<0.0001
More than 53	12(85.7)	1(7.1)	1(7.1)	0(0.0)	0.928
Gender					
Male	57(83.8)	10(14.7)	1(1.5)	0(0.0)	<0.0001
Female	90(79.6)	2(1.8)	18(15.9)	3(2.7)	<0.0001
Marital status					
Married	110(87.3)	9(7.1)	6(4.8)	1(0.8)	0.001
Divorced	18(94.7)	0(0.0)	1(5.3)	0(0.0)	0.425
Single	12(42.9)	2(7.1)	12(42.9)	2(7.1)	<0.0001
Widow	7(87.5)	1(12.5)	0(0.0)	0(0.0)	0.684
No of children					
None	29(87.9)	1(3.0)	1(3.0)	2(6.1)	0.049
1-3	79(79.8)	3(3.0)	16(16.2)	1(1.0)	0.009
4-6	28(77.8)	7(19.4)	1(2.8)	0(0.0)	0.002
More than 6	11(84.6)	1(7.7)	1(7.7)	0(0.0)	0.944
Education level					
None	1(100.0)	0(0.0)	0(0.0)	0(0.0)	0.972
Primary-incomplete	12(66.7)	6(33.3)	0(0.0)	0(0.0)	<0.0001
Primary-complete	16(72.7)	1(4.5)	3(13.6)	2(9.1)	0.030
Secondary-incomplete	0(0.0)	0(0.0)	2(66.7)	1(33.3)	<0.0001
Secondary-complete	11(73.3)	1(6.7)	3(20.0)	0(0.0)	0.614
College	107(87.7)	4(3.3)	11(9.0)	0(0.0)	0.002
Religion					
None	8(88.9)	1(11.1)	0(0.0)	0(0.0)	0.681
Christianity	139(80.8)	11(6.4)	19(11.0)	3(1.7)	0.681
Family support					
Yes	125(89.3)	5(3.6)	8(5.7)	2(1.4)	<0.0001
No	22(53.7)	7(17.1)	11(26.8)	1(2.4)	<0.0001

Depression and socioeconomic factors

Patient income and residence were significantly associated with depression. Patients residing within municipalities had higher prevalence of depression compared to those in rural areas ($p < 0.05$). Reported monthly income of between Ksh 10,000 and 20,000 was associated with higher prevalence of mild depression ($p <0.0001$)

Table 2 : Association between socioeconomic variables and depression

VARIABLES	MINIMUM DEPRESSION	MILD DEPRESSION	MODERATE DEPRESSION	SEVERE DEPRESSION	P VALUE
Occupation					
Farming	31(93.9)	2(6.1)	0(0.0)	0(0.0)	0.126
Business	79(81.4)	7(7.2)	8(8.2)	3(3.1)	0.294
Formal employment	28(70.0)	2(5.0)	10(25.0)	0(0.0)	0.007
Other	9(81.8)	1(9.1)	1(9.1)	0(0.0)	0.956
Average monthly income(Ksh)					
Less than 10,000	92(92.0)	0(0.0)	5(5.0)	3(3.0)	<0.0001
10,000-20,000	16(59.3)	8(29.6)	3(11.1)	0(0.0)	<0.0001
21,000-50,000	20(90.9)	2(9.1)	0(0.0)	0(0.0)	0.313
More than 50,000	9(81.8)	1(9.1)	1(9.1)	0(0.0)	0.956
Residence					
Municipality(High class)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0.003
Municipality(Middle class)	36(70.6)	3(5.9)	12(23.5)	0(0.0)	0.003
Municipality(Low class)	10(45.5)	7(31.8)	4(18.2)	1(4.5)	<0.0001
Outside municipality	101(94.4)	1(0.9)	3(2.8)	2(1.9)	<0.0001

Disease related factors and depression

Patients with recent diagnosis of diabetes (less than one year) had high prevalence of mild depression (66.7%), while longer duration of illness was associated with higher prevalence of moderate depression (25% for 5-10 years and 35.7% for 11-20 years), Table 3.

Treatment modality showed an association with depression. Patients on oral treatment had high prevalence of mild depression (16.7%) and those on injection had high prevalence of moderate depression (11.8%).

The prevalence of depression was significantly higher among patients who had difficulties adhering to treatment ($p<0.0001$). Patients with family history of diabetes appeared to report consistently lower prevalence of depression (3.7%) in comparison to those without family history of depression (41.1%).

Table 3 : Association between disease-related variables and depression

VARIABLE	MINIMUM DEPRESSION	MILD DEPRESSION	MODERATE DEPRESSION	SEVERE DEPRESSION	P VALUE
Duration of illness					
<1 year	3(25.0)	8(66.7)	1(8.3)	0(0.0)	<0.0001
1 year and 5 years	118(95.2)	1(0.8)	4(3.2)	1(0.8)	<0.0001
>5 years,< 10 years	11(68.8)	1(6.3)	4(25.0)	0(0.0)	0.246
> 10 years <20 years	15(53.6)	1(3.6)	10(35.7)	2(7.1)	<0.0001
> 20 years	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0.003
Type of diabetes					
Type 1	106(84.8)	4(3.2)	13(10.4)	2(1.6)	0.050
Type 2	41(73.2)	8(14.3)	6(10.7)	1(1.8)	0.050
Treatment modality					
Injection	118(81.9)	6(4.2)	17(11.8)	3(2.1)	0.038
Oral tablets	29(80.6)	6(16.7)	1(2.8)	0(0.0)	0.018
Injections and tablets	0(0.0)	0(0.0)	1(100.0)	0(0.0)	
Adherence difficulties					
Yes	32(62.7)	4(7.8)	14(27.5)	1(2.0)	<0.0001
No	115(88.5)	8(6.2)	5(3.8)	2(1.5)	<0.0001
Family history of diabetes					
Yes	104(96.3)	3(2.8)	1(0.9)	0(0.0)	<0.0001
No	43(58.9)	9(12.3)	18(24.7)	3(4.1)	<0.0001
Frequency of blood glucose monitoring					
Not at all	14(63.6)	7(31.8)	1(4.5)	0(0.0)	<0.0001
Once a day	18(100.0)	0(0.0)	0(0.0)	0(0.0)	0.202
>1 a day	3(42.9)	1(14.3)	1(14.3)	2(28.6)	<0.0001
Once a week	23(69.7)	0(0.0)	10(30.3)	0(0.0)	<0.0001
>1a week	2(50.0)	0(0.0)	1(25.0)	1(25.0)	0.002
Once a month	6(66.7)	2(22.2)	1(11.1)	0(0.0)	0.275
Occasionally	81(92.0)	2(2.3)	5(5.7)	0(0.0)	0.003

Behavioural characteristics and depression

The prevalence of depression was 17.7% among patients who did not consume alcohol while a higher prevalence of 36.4% was seen in the group of patients who reported alcohol consumption. Smoking was not associated with depression ($p = 0.534$).

Table 4: Association between behavioural characteristics and depression

VARIABLE	MINIMUM DEPRESSION	MILD DEPRESSION	MODERATE DEPRESSION	SEVERE DEPRESSION	P VALUE
Smoking					
Yes	9(100.0)	0(0.0)	0(0.0)	0(0.0)	0.534
No	138(80.2)	12(7.0)	19(11.0)	3(1.7)	0.534
Alcohol consumption					
Yes	7(63.6)	0(0.0)	4(36.4)	0(0.0)	0.031
No	140(82.4)	12(7.1)	15(8.8)	3(1.8)	0.031

Discussion

In the study, we found that 19 % of the study participants met the Beck's Depression Inventory (BDI-II) criteria for a diagnosis of depression, which was hitherto undiagnosed. This rate is comparable to studies done in other countries that included a study in India in which a prevalence range of 8.5% to 32.5% was observed(Chaudhry et al., 2010) and a study in the USA,where the prevalence of depression among adults has been reported to range between 2% and 28%(Li et al., 2008).The prevalence is, however, lower than that in a study conducted in a Nigerian teaching hospital in which a prevalence of 30% was observed(Bawo Onesirosan James et al., 2010),and in Greece, where a rate of 33.4% was observed(Sotiropoulos et al., 2008b).

A number of factors were found to be significantly associated with depression. In this study, an association was observed between gender and depression. The prevalence of depression in females was higher than the prevalence of depression in males (20.4% versus 16.2%). A number of studies support this finding. In a study done in India, it was reported that the prevalence of depression observed in females is higher than that in males(Chaudhry et al., 2010).In another study in Bangladesh ,it was demonstrated that depression is more common among females(Rahman et al., 2011).It possible that diabetes mellitus may impair the fulfilment of gender specific social roles, hence the observed high proportion of depression in women.

There was a significant association between being single and depression. Single patients had a higher prevalence of depression (57.1%, $p<0.0001$) compared to patients in other marital states. This observation is consistent with findings of a study done in Bangladesh that reported that depression was common among single patients(Rahman et al., 2011).In a study done in Nepal,however,it was reported that marital status was not significantly associated with depression in patients living with diabetes mellitus(Niraula et al., 2013).Being single is stressing because it involves dealing with loneliness,sitigma and lack of a supportive adult relationship, hence the high prevalence of depression in this group of patients.

As expected, family support was significantly associated with depression in this study. Those patients who did not get any kind of support from their families had a higher prevalence of depression (46.3%, $p<0.0001$) compared to the prevalence (10.7%, $p<0.0001$) among those patients that reported receiving family support. People with family support are likely to quickly mobilize resources that enable them deal with the distress that is brought about by the diagnosis of diabetes, hence the low prevalence of depression in this group of patients.

Low class municipality residents had a higher prevalence of depression (54.5%) compared to the prevalence (5.6%) among those patients who resided outside the municipality. Although it was not evaluated during the study, living outside the town enables the patient to have access to social support that is not available in the towns. Rural areas are also associated with a low cost of living. Hence, residents of rural areas are not exposed to the distressing challenges that their counterparts within the town are faced with. The study done in Nepal, supports this observation that urban residence is associated with higher scores on the BDI scale(Niraula et al., 2013).

Patients with monthly income of between Ksh 10,000 and 20,000 had a higher prevalence of mild depression (29.6%,$p<0.0001$).Compared to other groups, patients with average income of less than ksh10,000 had the highest prevalence of severe depression(3%,$p<0.0001$).This observation is supported by a study done in India in which it was reported that the prevalence of depression was higher among persons with low income(Mendenhall et al., 2012).From the Nepal study, however, it was reported that higher personal income was associated with higher scores on the BDI scale(Niraula et al., 2013).Low monthly income predisposes patients to economic distress because these patients are not able to afford the drugs and lifestyle that a diagnosis of diabetes imposes on them.

It was observed in this study that patients with recent diagnosis of diabetes had a high prevalence of mild depression (66.7%, $p<0.0001$) while those with longer duration of illness had a higher prevalence of moderate depression (25% for 5-10 years and 35.7% for 11-20 years).It seems that as the patients live longer with diabetes mellitus, there is a deterioration in the symptoms and associated complications, hence the higher scores on the BDI scale. This finding differs from the findings of a study in Nepal that showed the early period of the disease to be associated with greater depression severity(Niraula et al., 2013).

Those patients who reported difficulties with adherence to treatment had a higher prevalence of depression (37.5%, $p<0.0001$).The prevalence of depression in those who did not have difficulties adhering to treatment was 11.5%.It can be speculated that since depression is associated with helplessness and loss of hope, people who are depressed are likely to encounter difficulties in the management of their condition, hence the high prevalence of depression in this group. This finding is supported by studies from a number of countries including(Kalsekar ID, Madhavan SS, Amonkar MM, Makela EH, Scott VG & BLM:, 2006) ,(Niraula et al., 2013) and(Goldney RD, Phillips PJ, Fisher LJ, 2004).

Those patients with a family history of the illness had a lower prevalence of depression (3.7%) compared to their counterparts who did not have a family history of the condition (prevalence of 41.1 %, $p<0.0001$).The possible explanation for this observation is that prior experience with a member of the family living with diabetes may reduce the fear and anxiety associated with being diagnosed with diabetes mellitus. Findings of the study done in Nepal support this

observation of lower depression prevalence among patients with a family history of diabetes mellitus(Niraula et al., 2013).

Finally, among the behavioural characteristics assessed, alcohol consumption had a significant association with depression. While the proportion of depression among patients who admitted to consuming alcohol was 36.4%, it was 17.7% among those who did not consume alcohol (p=0.031), this was contrary to findings by Tann SS, Yabiku ST, Okamoto SK, and Yanow J. (2007), however, other population-based studies have consistently found that high alcohol intake increases one's risk of developing Type 2 diabetes (Carlsson et al., 2000; Holbrook, Barrett-Connor, & Wingard, (1990); Howard, Arnsten, & Gourevitch, (2004); Kao, Puddey, Boland, Watson, & Brancati, (2001), while moderate alcohol intake has not been shown to increase risk (Kao et al.), and in fact may have some protective value (Anderson, 2001; Kao et al., Howard et al.). People who are depressed tend to consume alcohol in an attempt to run away from what is worrying them. There was no significant association between smoking and depression (p=0.534).

Conclusion

From the study, a significant proportion of patients diagnosed with diabetes mellitus have comorbid depression. The female gender, being single, lack of family support, urban residence and low income were the sociodemographic and socioeconomic factors that were observed to have a significant association with depression among diabetes patients. Among the disease-related factors, difficulties adhering to treatment and longer duration with diabetes mellitus were associated with increased severity of depression. The proportion of patients with depression was lower among those with a family history of diabetes mellitus. Of the behavioural characteristics studied, only alcohol consumption was observed to be significantly associated with a higher proportion of patients with depression.

Recommendations

The screening and treatment of depression should be integrated into diabetes care settings. This will lead to early detection and treatment of depression that is usually concealed in patients suffering from diabetes mellitus. Further, studies to establish whether there is causal relationship between the independent variables and depression may be necessary.

Competing interests

The authors declare no competing interest.

Authors' contributions

ZN: Study design, coordination of data collection, entry and analysis and drafting and editing of the manuscript. JM: Study design, data analysis and manuscript review. JO: Study design, coordination of data collection and reviewing of the manuscript. MC: Study design, data analysis and supervision and manuscript editing. MG: Study design, data analysis and manuscript review. All authors read and approved the final draft of the manuscript.

References

Anderson RJ (2001). The prevalence of comorbid depression in adults with diabetes: A meta-analysis. Diabetes Care;24(6):1069–1078. [PubMed]

Andreoulakis, E., Hyphantis, T., Kandylis, D., & Iacovides, a. (2012). Depression in diabetes mellitus: a comprehensive review. *Hippokratia*, *16*(3), 205–14. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3738724&tool=pmcentrez&rendertype=abstract

Carlsson S, Hammar N, Efendic S, Persson PG, Östenson CG, Grill V. (2000) Alcohol consumption, Type 2 diabetes mellitus, and impaired glucose tolerance in middle-aged Swedish men. Diabetic Medicine; 17:776–781. [PubMed]

Chaudhry, R., Mishra, P., Mishra, J., Parminder, S., & Mishra, B. P. (2010). Psychiatric morbidity among diabetic patients: A hospital-based study. *Industrial Psychiatry Journal*, *19*(1), 47–9. doi:10.4103/0972-6748.77637

Goldney RD, Phillips PJ, Fisher LJ, W. D. (2004). Diabetes, depression and quality of life: a population study. *Diabetes Care*, (27), 1066–107.

Gonzalez, J. S., Peyrot, M., McCarl, L. A., Collins, E. M., Serpa, L., Mimiaga, M. J., & Safren, S. A. (2008). Depression and diabetes treatment nonadherence: a meta-analysis. *Diabetes Care*, *31*(12), 2398–403. doi:10.2337/dc08-1341

Holbrook TL, Barrett-Connor E, Wingard DL. (1990) A prospective population-based study of alcohol use and non-insulin-dependent diabetes mellitus. American Journal of Epidemiology.; 132(5):902–909. [PubMed]

Howard AA, Arnsten JH, Gourevitch MN. (2004) Effect of alcohol consumption on diabetes mellitus: A systematic review. Annals of Internal Medicine.;140(3):211–219. [PubMed]

International Diabetes Federation. (2012). *Diabetes atlas* (5th ed.). Brussels: IDF.

International Diabetes Federation. (2013). *Diabetes atlas* (6th ed.). Brussels: IDF.

James, B. O., Morakinyo, O., Eze, G. O., Lawani, A. O., & Omoaregba, J. O. (2010). Depression and subjective quality of life among outpatients with diabetes mellitus at a teaching hospital in Nigeria. *Mental Health in Family Medicine*, *7*(3), 179–83. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3018949&tool=pmcentrez&rendertype=abstract

James, B. O., Omoaregba, J. O., & Eze, G. (2010). Depression among patients with diabetes mellitus in a Nigerian teaching hospital. *South African Journal of Psychiatry*, *16*(2), 61–64.

Kagee, A. (2008). Symptoms of Depression and Anxiety among a Sample of South African Patients Living with a Chronic Illness. *Journal of Health Psychology*, *13*(4), 541-549.

Kalsekar ID, Madhavan SS, Amonkar MM, Makela EH, Scott VG, D. S., & BLM:, E. (2006). Depression in patients with type 2 diabetes: impact on adherence to oral hypoglycemic agentsNo Title. *Ann Pharmacother*, *40*(4), 605–611.

Kao WHL, Puddey IB, Boland LL, Watson RL, Brancati FL. (2001) Alcohol consumption and the risk of Type 2 diabetes mellitus: Atherosclerosis risk in communities study. American Journal of Epidemiology.;154(8):748–57. [PubMed]

Li, C., Ford, E. S., Strine, T. W., & Mokdad, A. H. (2008). Prevalence of depression among U.S. adults with diabetes: findings from the 2006 behavioral risk factor surveillance system. *Diabetes Care*, *31*(1), 105–7. doi:10.2337/dc07-1154

Mendenhall, E., Shivashankar, R., Tandon, N., Ali, M. K., Narayan, K. M. V., & Prabhakaran, D. (2012). Stress and diabetes in socioeconomic context: a qualitative study of urban Indians. *Social Science & Medicine (1982)*, *75*(12), 2522–9. doi:10.1016/j.socscimed.2012.09.040

Niraula, K., Kohrt, B. A., Flora, M. S., Thapa, N., Mumu, S. J., Pathak, R., … Shrestha, R. (2013). Prevalence of depression and associated risk factors among persons with type-2 diabetes mellitus without a prior psychiatric history: a cross-sectional study in clinical settings in urban Nepal. *BMC Psychiatry*, *13*, 309. doi:10.1186/1471-244X-13-309

Perveen, S., Otho, M. S., Siddiqi, M. N., Hatcher, J., & Rafique, G. (2010). Association of depression with newly diagnosed type 2 diabetes among adults aged between 25 to 60 years in Karachi, Pakistan. *Diabetology & Metabolic Syndrome*, *2*, 17. doi:10.1186/1758-5996-2-17

Rahman, M., Rahman, A., & Flora, M. S. (2011). Depression and associated factors in diabetic patients attending an urban hospital of Bangladesh. *Intern J Collaborative Res Intern Med Public Health*, *3*(1), 65–76.

Sotiropoulos, A., Papazafiropoulou, A., Apostolou, O., Kokolaki, A., Gikas, A., & Pappas, S. (2008a). Prevalence of depressive symptoms among non insulin treated Greek type 2 diabetic subjects. *BMC Research Notes*, *1*, 101. doi:10.1186/1756-0500-1-101

Sotiropoulos, A., Papazafiropoulou, A., Apostolou, O., Kokolaki, A., Gikas, A., & Pappas, S. (2008b). Prevalence of depressive symptoms among non insulin treated Greek type 2 diabetic subjects. *BMC Research Notes*, *1*, 101. doi:10.1186/1756-0500-1-101

Tann SS, Yabiku ST, Okamoto SK, Yanow J. (2007) TriADD: the risk for alcohol abuse, depression, and diabetes multimorbidity in the American Indian and Alaskan native population. Am Indian Alsk Native Ment Health Res.; 14(1):1–23. [PMC free article] [PubMed]