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PREVALENCE AND FACTORS ASSOCIATED WITH COMORBID DIABETES AND DEPRESSION AMONG PATIENTS ATTENDING A PRIVATE HOSPITAL IN NAIROBI, KENYA

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PREVALENCE AND FACTORS ASSOCIATED WITH COMORBID DIABETES AND DEPRESSION AMONG PATIENTS ATTENDING A PRIVATE HOSPITAL IN NAIROBI, KENYA

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ABSTRACT

Objectives: This study sought to elucidate the prevalence and factors associated with depression among patients with type 2 diabetes attending a diabetes clinic in a private hospital located in Nairobi, Kenya.

Methods: A cross-sectional analytic design was used to answer the research question. Data was collected using a closed-ended interviewer-administered questionnaire based on Socio-demographic data, data on patient history, and data on depression symptoms. Frequency distribution was used to calculate the prevalence of depression. Binary logistic regression was used to assess the association between the variables of interest and comorbid depression and diabetes at the bivariate and multivariate levels.

Results: The prevalence of depression among diabetes type 2 patients was 21.94%. Those who used injectable medication had a 2.195 higher odds of being depressed (CI: 1.098-4.389, $p=0.026$), compared to those that used oral hypoglycaemics. No other factor was significantly associated with depression.

Conclusion: Prevalence of depression is comparable with other studies. Diabetes type 2 treatment and patient guidelines may need to be reviewed in favour of oral over injectable hypoglycaemics, whenever clinically possible.

INTRODUCTION

Traditionally, the management of diabetes mellitus type 2 has been geared towards glycemic control and lifestyle modification (1,2). This includes insulin therapy, dieting, physical activity, and reduction of alcohol and tobacco use (2,3). Indeed, as is often the approach with communicable disease care, treating the physical symptom is usually expected to deal with the problem altogether. The long-term nature of diabetes, as with other chronic diseases, however, means that it affects more than just the physical health of the patient. These effects can be felt on the mental as well as the social aspects of the patient's life (1,4).

Several studies around the globe reveal that diabetes type 2 patients are increasingly at risk of mental disorders. Chief among these are depression and anxiety disorders (5). Studies show that the prevalence of depression among diabetes type 2 patients ranges from 2% to 35% (5–7). Closer to home, studies carried out among Kenyan hospital populations place the prevalence of comorbid depression among patients with diabetes type 2 at approximately one-fifth of all diabetes type 2 patients, in both rural and urban areas (8,9).

Diabetes management guidelines used in low and middle-income countries (LMIC) make mention of psychotherapy for diabetes patients. Nevertheless, the operationalization of these guidelines is often wanting. This situation is also mirrored in Kenya. An overview of the Kenya National Diabetes Strategy 2010 to 2015, as well as the National Clinic Guidelines for Management of Diabetes Mellitus, shows that the mental health of diabetes patients has long since been ignored inpatient care (10,11). Even though psychotherapy is mentioned in care guidelines, it may not be routinely offered during care. The stigma placed on mental illness in low and middle-income countries (LMICs) has increased the treatment gap for

depression among diabetes patients by making it difficult for them to seek mental health care services (12–14).

The problem of comorbid depression in diabetes is further compounded by the bidirectional relationship of causation that exists between the two conditions (15–17). Depression results in lifestyle habits that place a person at increased risk of developing diabetes or worsening the condition if it already exists (18,19). On the flip side, diabetes is associated with an increased risk of developing depression or depressive symptoms (17,20,21). Additionally, in LMIC, the stigma faced by people with mental illness reduces the likelihood that patients with an already pre-existing condition such as diabetes will seek additional care for mental ill-health, including depression (13).

Depression has several adverse effects on the pathophysiology and management of diabetes. It has been associated with an approximated 50% increase in medical costs for chronic diseases even after controlling for the severity of the physical illness (22–24). Individuals with diabetes and comorbid depression had higher health care use and expenditure than non-depressed individuals (25). It also has several maladaptive effects. This includes the amplification effect it has on somatic symptoms and functional disability. It also increases the likelihood that one will engage in adverse health behaviors such as smoking, alcohol use, sedentary lifestyle, and unhealthy eating, which have far-reaching adverse impacts on diabetes care (26,27). It also results in several maladaptive physiological effects - High depression rates have been associated with increases in the severity of diabetes symptoms (17,28,29).

Besides, being depressed is associated with decreased self-care and less adherence to medical regimens. This is because depression adversely influences the expectations and benefits of the efficacy of treatment (30). Depression also leads to increased withdrawal and social isolation, which

makes it more difficult for a person to access much-needed social support for the management of diabetes. It is also prone to reducing cognitive functioning and memory as well as influencing dietary choices and reducing energy to exercise and follow recommended self-management regimens (20,27).

There is enough evidence that being able to control and manage depression in diabetes effectively has better outcomes for diabetes care. Further, there is a need for increased awareness of comorbid depression in patients with diabetes, as this can inform medical practice. In addition, knowledge of its associated factors will allow physicians to tailor healthcare to meet the unique demands of this co-morbidity. This study thus sought to examine the prevalence and factors associated with depression among patients with diabetes attending the Aga Khan University Hospital Nairobi (AKUHN).

MATERIALS AND METHODS

Study Design: The study was an analytical cross-sectional design.

Study Site: The study was carried out at the Diabetes clinic at Aga Khan University Hospital in Nairobi (AKUHN), Kenya.

Study Population: The study population comprised patients attending the diabetes clinic at AKUHN. Only those with type 2 diabetes and aged between 15 and 45 years were eligible for the study. Those meeting inclusion criteria were excluded if they had a pre-existing mental condition other than depression.

Sample Size: The sample size for the study was estimated at 336 patients based on an estimated prevalence of 30%.

Sampling Procedure: Systematic sampling was used to recruit patients into the study. Approximately 330 patients attend the AKUHN diabetes clinic per month. Given that data collection was to take three months, the sampling frame for the study was 990

patients. The sampling fraction was $(990/336) = 2.94 \approx 3$. The second diabetes patient who appeared on the first day of data collection was recruited into the study. Thereafter, every 3rd patient was approached to participate in the study until the minimum sample size of 336 was achieved. In the event a patient who had already participated in the study revisited the clinic and was re-selected, the subsequent patient was recruited. After that, every 3rd patient until the minimum sample size was reached.

Data Collection: Data collection was achieved through the use of a questionnaire. The questionnaire collected information on patient socio-demographics, patient history, and depression. The questions about depression were adopted from the Patient Health Questionnaire (PHQ-9) developed by Kroenke, Spitzer et al. (31). The PHQ-9 is a brief tool (9 items) that provides data on the diagnosis as well as the severity of depression (33). It was selected due to its brevity to reduce inconvenience to potential study respondents and because it is validated for use in Kenya (34,35). The questionnaire was pilot-tested at a separate clinic.

Data was collected using interviewer-administered questionnaires over three months. Data collection occurred during the patients' routine visits to the Diabetes Clinic. Consent was first sought from potential respondents before data collection began. Data on weight, height, and patient history were collected from patient records.

Data Analysis: Collected data were manually checked for accuracy and completeness. The data was entered and processed using Microsoft Excel Package and STATA 13. Means and Standard Deviations were used to describe continuous data. Frequency distributions were used to summarize categorical data.

The prevalence of comorbid depression was estimated from the proportion of patients who scored above the depression cut off scores for the PHQ-9 questionnaire. Logistic

regression was used to assess relationships between variables at the bivariate level. To adjust for confounding, at the multivariate level, all variables of interest that are significantly associated with comorbid depression at the bivariate level were considered together using Binary Logistic Regression. The inclusion into the multivariate model were variables significant at a p-value of 0.25. All statistical tests were two-sided, and the level of statistical significance was set at $p < 0.05$.

Ethical Considerations: The study was reviewed by the Aga Khan University Ethics Review Committee before data collection. Participation in the study was voluntary and written informed consent was sought from adult patients or caregivers of minors. In the case of minors, permission was also sought in addition to the consent from the caregivers. Confidentiality of data was assured using encrypted data files to store the data. Questionnaires and consent forms were stored under lock and key in a filing cabinet. Only the research team had access to these for the duration of the study. Privacy and anonymity were maintained during the data

collection process to ensure that all patient rights were protected. Participants were free to withdraw from the study at any time. Patients found to have depression (regardless of severity) were offered counseling free of charge at the Family Medicine Centre and Diabetes clinic and referred to the hospital psychiatrist for further follow-up.

RESULTS

Socio-demographic Characteristics and Patient History

Three hundred fifty-one respondents were recruited into the study. The prevalence of depression comorbid with diabetes was 21.94%. In terms of severity, 80.52% of those who were depressed suffered mild depression while the rest (19.48%) suffered moderate depression. The mean age of respondents was 52.7 years (SD=12.1). The average monthly income of KES. 118,133.3 (SD=247,100.6). Males accounted for 53.3% of the sample and females 46.7%. The socio-demographic characteristics and patient history of the study respondents are summarized in Table 1.

Table 1
Socio-demographic Characteristics and Patient History

Characteristic	Category	Frequency (n)	Percent (%)
Sex	Female	164	46.7%
	Male	187	53.3%
Religion	Christian	334	95.2%
	Hindu	3	0.9%
	Muslim	12	3.4%
	Other (specify)	2	0.6%
Education Level	None	8	2.3%
	Primary	39	11.1%
	Secondary	87	24.8%
	College	90	25.6%
	University	108	30.8%
	Other (specify)	19	5.4%
Occupation	Farmer	32	9.1%
	Trader/Business	102	29.1%
	Casual Labourer	1	0.3%
	Professional	153	43.6%
	Student	1	0.3%

	Other (specify)	62	17.7%
Marital Status	Never Married	14	4.0%
	Married	299	85.2%
	Separated	3	0.9%
	Divorced	6	1.7%
	Widowed	29	8.3%
Diabetes-Related Complications	Yes	83	23.6%
	No	268	76.4%
Other co-morbidities	Yes	261	74.4%
	No	90	25.6%
Friends and Family are dependable	Strongly Agree	324	92.3%
	Agree	19	5.4%
	Neutral	6	1.7%
	Disagree	2	0.6%
Friends and Family accept	Strongly Agree	325	92.6%
	Agree	18	5.1%
	Neutral	6	1.7%
	Disagree	2	0.6%
Age	<45	61	17.4%
	45-60	179	51.0%
	>60	111	31.6%
BMI	Underweight	3	0.9%
	Normal	70	19.9%
	Overweight	139	39.6%
	Obese	139	39.6%
Type of Hypoglycaemic	Oral	190	55.2%
	Injectable	80	23.3%
	Both	74	21.5%

Factors Associated with Depression among Diabetes Patients

Logistic regression was used to assess factors associated with depression among diabetes type 2 patients at the bivariate level. Variables significant at a P-value of 0.25 were Education level, complication, income, year since diagnosis, medication type, and BMI. To find a parsimonious model that fits the data, the variables were significant at a p-value <0.25, and those that were clinically important were included instead of using a stepwise method of selection. The variables that were selected for the model were level of education, Complications, income, Years since diagnosis, medication type, BMI, and other co-morbidities.

Variables were tested for the multicollinearity assumption so that variables that were correlated would be excluded. This was done using the variance inflation test, and the result was a mean VIF of 1.26, indicating that the model fits the data. To be sure the relevant variables had not been omitted, the linktest was done, which gave a *hatsq* p-value of 0.55. In the final multivariable model, the type of hypoglycaemic drug was the only variable statistically significantly associated with depression. Those who used injectable medication had a 2.195 higher odds of being depressed (CI: 1.098-4.389, p=0.026), compared to those that used oral hypoglycaemics. This is shown in Table 2.

Table 2
Logistic Regression of Factors Associated with Depression among Diabetes Patients

Characteristic	Category	Bivariate			Multivariate		
		Odds ratios	Confidence interval	P-Value	Odds ratios	Confidence interval	P-Value
Sex	Female	1.0	Ref	0.792			
	Male	0.934	0.563-1.550				
Religion	Christian	1.0	Ref	0.599			
	Hindu	1.852	0.165-20.719				
	Muslim	1.852	0.542-6.327				
	Other	3.704	0.229-59.958				
Age	<45	1.0	Ref	0.806			
	45-60	0.997	0.499-1.990				
	>60	0.830	0.389-1.770				
Education level	none	1.0	Ref	0.262*	1.0	Ref	
	primary	3.333	0.691-16.077		0.361	0.0729-2.184	0.554
	Secondary and college	1.037	0.456-2.358		0.469	0.096-2.297	
	university	0.667	0.271-1.641		0.277	0.051-1.351	
	other	0.889	0.235-3.364		1.522	0.075-3.825	
Occupation	Farmer	1.0	Ref	0.488			
	Trader/businessman	1.407	0.519-3.808				
	casual laborer	1	0				
	professional	1.013	0.382-2.688				
	student	1	0				
	other	1.637	0.574-4.671				
Marital status	Never married	1.0	Ref	0.616			
	married	0.736	0.224-2.421				
	separated	1	0				
	divorced	0.500	0.044-5.737				
	widowed	0.400	0.083-1.919				
Complications	No	1.0	Ref	0.153*	1.0	Ref	

	yes	1.519	0.863- 2.675		1.437	0.701- 2.946	0.322
Other comorbidities	no	1.0	Ref	0.826	1.0	Ref	
	Yes	1.068	0.595- 1.915		0.780	0.0379- 1.606	0.501
Medication type	Oral	1.0	Ref		1.0	Ref	
	Injectable	2.039	1.110- 3.745	0.023*	2.195	1.098- 4.389	0.026*
BMI	Normal	1.0	Ref	0.082*	1.0	Ref	
	Overweight	0.573	0.302- 1.088		0.599	0.259- 1.383	0.426
	Obese	0.477	0.247- 0.919		0.818	0.369- 1.809	
Weight		0.991	0.974- 1.010	0.329			
Income		0.999	0.997- 1.000	0.049*	0.999	0.999- 1.000	0.552
Years since diagnosis		0.98	0.946- 1.015	0.256*	0.973	0.929- 1.019	0.249
Number of meds		0.951	0.828- 1.093	0.480			

DISCUSSION

This study found that slightly more than one-fifth (21.94%) of patients attending the diabetes clinic at a private hospital in Nairobi, Kenya, had depression. This finding is in line with several local and international studies, which show that the prevalence of depression among diabetes type 2 patients ranges from 2% to 25% (5–9). Nonetheless, a study carried out in Kenya's largest public hospital found that the prevalence of depression comorbid with diabetes was 32.3% (36), much higher than the prevalence in this study. This suggests a difference between patients attending public and private facilities that may account for the difference in prevalence. The comparability of results notwithstanding, the fact that the prevalence of diabetes type 2 is set to rise in the future (37,38), means that there is likely to be a concomitant increase in the prevalence of comorbid depression. There is a need to put in place programs to actively and routinely screen for and manage depression

comorbid with diabetes in primary care settings, especially in LMIC.

This study found that the use of injectable hypoglycaemics was associated with depression (AOR=2.195, CI: 1.098-4.389, $p=0.026$) compared to oral hypoglycaemics. This is contrary to other studies that hypothesize that oral hypoglycaemics are associated with depression (39,40). Other mental disorders, such as phobias or anxiety disorders, have been related to Injection of insulin (41,42). Further, insulin injection leads to weight gain, which lies along the causal pathway of depression among diabetes type 2 patients (30,39). None of the other clinical factors assessed in this study were statistically significantly associated with depression. This is contrary to studies that have shown significant associations between depression among diabetes type 2 patients and being obese, and having a BMI higher than 30 (30,43); the presence of another non-diabetic co-morbidity (30); and a high number of diabetes complications.

Different studies in the past have found several socio-demographic factors to be associated with depression among diabetes type 2 patients. These include age – with younger people at a higher risk of depression (30); low socioeconomic status (30); female gender (27,30,43); low level of education (30), being unmarried or widowed (6,30). In this study, none of the socio-demographic factors was statistically significantly associated with depression. At the bivariate level, income was significantly associated (OR=0.999, CI: 0.997 – 1.000; $p=0.049$), an association that was insignificant at the multivariate level. This may have been so due to the ceiling effect, given that majority of diabetes patients attending AKUHN are middle to high-income individuals.

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