ORIGINAL ARTICLE

Depression and Associated Factors Among the Patients with Type 2 Diabetes in Rwanda.

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Competing Interests: The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

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ABSTRACT

Background: Various studies have found a greater prevalence of depression among patients having one or more chronic non communicable disease like diabetes mellitus than in the general population. This co-morbidity is linked with serious health consequences such as high mortality and morbidity, debility, low quality of life and increased health costs. The aim was to determine the prevalence of depression among patients with diabetes attending three selected district hospitals in Rwanda. Socio-demographic factors associated with depression were also explored.
Methods: It was a descriptive cross sectional study. A sample of 385 was selected randomly to participate in the study and 339 complete the questionnaires making a response rate of 88%. The Patient Health Questionnaire-9 (PHQ-9) was used to screen depression. Descriptive and inferential analysis were done.
Results: The majority of respondents 83.8% (n=284) had depression. Among them 17.9% (n=61) had moderately severe to severe depression while 81.9% (n=223) had minimal to moderate depression. A statistically significant association was found between age and depression (p=0.01) also between gender and depression (p=0.02). Significance was determined at P<0.05.
Conclusion: we found a high prevalence of depression among patients with diabetes. The regular screening of depression among these patients is recommended.
KEYWORDS: Co morbidity of depression with diabetes, depression, diabetes

INTRODUCTION

Different studies have confirmed the link between Non-Communicable Diseases (NCDs) and development of depression as well as other mental disorders with severe health consequences related to this co morbidity(1-4). According to the American Heart Association study; depression among patients with Cardio-vascular diseases was 17% , 23% was found in patients with cerebrovascular cases, 27% in diabetes patients and more than 40% of patients with cancer(5). Depression in patients with chronic non communicable diseases including cancer, diabetes mellitus, stroke or cardiovascular disease is 2-4- fold more prevalent than in people who do not have these diseases (3).

Some of the health problems related to the co-morbidity of depression and NCDs indicated in different global studies include high rate of mortality and morbidity, debility, low quality of life and increased cost of health as well as non-adherence to treatment (4, 6).

It is in this perspective that the World Health Organization (WHO) has endorsed the consistent screening of depression among patients with one or more NCDs (3). However, despite this recommendation for all countries depression continues to be less detected in chronic illnesses, largely because many health professionals focus more on physical complaint which is mostly the reason for the hospital visit, and forget the accompanying depression (7).

Rwanda as one of developing countries experiences an increase of non-communicable diseases (8). While statistics from WHO (9) show that communicable diseases constitute 90% of chief complaints in health care facilities in the country, depression estimated to prevail between 15% and 25% in the Rwandan population constitutes another significant health burden (10). Although the estimated co-morbidity of depression with NCDs in Rwanda is alarming where the prevalence of depression in patients with diabetes and hypertension is considered to be 27% and 29% respectively (10); there is no research based evidence that has been done in Rwanda to establish the co-morbidity of depression with NCDs. The first objective was to determine the prevalence of depression in patients with type 2 diabetes mellitus attending three selected district hospitals in Rwanda and the second objective was to identify the associated socio-demographic factors to this co-morbidity.

MATERIALS AND METHODS

Research design: Cross-sectional quantitative descriptive design was used to determine prevalence of depression among patients with type 2 diabetes mellitus and associated socio-demographic factors.

The sample size for the actual study was 385 participants and this size was calculated as follows, using the sample size formula given by Chow, Shao, and Wang (11).

Sample size calculation (prevalence of depression among diabetic/hypertensive patients): The sample size was calculated using the formula, $n = Z^2_{(1-\alpha/2)}pq/d^2$ (where $Z_{(1-\alpha/2)} = 1.96$ at 95% confidence; p = prevalence of depression; $q = 1\text{-}p$; d = absolute allowable error (precision around the proportion to estimate; i.e. how wide the 95% confidence interval should be). For this study, we assumed maximum possible variability (i.e. $p = 0.5$; $q = 0.5$) and precision (d) ± 5% (i.e. the 95% confidence interval will have a width of 5%). A total of 385 participants was targeted but only 339 participated making the response rate of 88%.

Sample size (factors associated with depression): Group sample sizes of respondents in group one (depressed) and respondents in group two (non-depressed) achieve 80% power to detect a difference between the group proportions of 0.155 or 15.5%. The proportion exposed to a given factor in group two (the non-depressed group) was assumed to be 0.50 or 50%. The test statistic used was the two-sided Z test with pooled variance. The significance level of the test was targeted at 0.05 or 5% (11).

Sampling strategy: A systematic random sampling was used to choose the sample from the larger population which was all diabetic patients aged 21 years and above attending three selected district hospitals. Among these three hospitals, two of them were district hospitals from urban area and one from rural area with endocrinology and mental services. To obtain the systematic simple size; the sample size for each hospital was 128 participants for two hospitals and 129 for one hospital. This number was obtained by dividing the sample size for the study (385) by 3 (three hospitals) for equal distribution of participants. All registered diabetic patients at each of three hospitals scheduled for appointment during the period of data collection were then regarded as population size (N). After obtaining the permission letter from the nurse in charge to access patient registry, the list was done for (N) and code numbers were assigned starting from 1 for each hospital. The systematic random sample for each hospital was then obtained.

Data collection instruments: A Socio-demographic and medical information

questionnaire was constructed by the researchers to collect demographic data. Depression was screened using the PHQ-9. The PHQ-9, contains 9 items, it offers psychologists' concise, it is a self-administered instrument that measure depression. It includes DSM-IV depression criteria with other major symptoms of depression into a brief self-report tool that is globally used for diagnosing depression, as well as selecting and monitoring treatment (12).

PHQ-9 scoring: Patient completes PHQ-9 Quick Depression Assessment:

Scoring: Count the number (#) of boxes checked in a column. Multiply that number by the value indicated below, then add the subtotal to produce a total score.

The possible range is 0-27. Use the table below to interpret the PHQ-9 score

Not at all (#) _____ x 0 = _____
Several days (#) _____ x 1 = _____
More than half the days (#) _____ x 2 = _____
Nearly every day (#) _____ x 3 = _____
 Total score_____

Table 1. Interpreting PHQ-9 Scores

Total score	Depression severity	Action
1-4	Minimal depression	The score suggests the patient may not need depression treatment
5-9	Mild depression	Physician uses clinical judgment about treatment, based on patient's duration of symptoms and functional impairment
10-14	Moderate depression	
15-19	Moderately severe depression	Warrants treatment for depression, using antidepressant, psychotherapy and/or a combination of treatment
20-27	Severe depression	

Data collection procedures: Data was collected from three selected districts hospitals by the researcher with the help in each case of a research assistant who was a mental health nurse with a diploma in mental health nursing working at the respective study area hospital. At each of the selected hospitals the researcher and research assistant approached the endocrinology service in that hospital, asked permission to the nurse in charge to access the patient registry, and then identified patients scheduled for follow-up in a period of data collection. The researcher and research assistant made a list of those patients and selected a random sample of 128 patients for two of the hospitals and 129 patients for the third hospital using the systematic random sampling. After establishment of each random sample, the researcher and research assistant met each patient in the sample when they came for follow-up at the hospital. The meeting with the patient was held in a private room and the patient was requested by the researcher or research assistant to participate in the study, with the researcher explaining to the patient the purpose of the study and asking him/her to voluntary participate. The researcher collected the questionnaire back immediately once the patient finish to answer; this was taking approximatively 10 to 15 minutes. For those who could not read and write; the researcher interviewed them. Data was collected over a period of six weeks.

Data analysis: Data analysis was done using Stata 13. Cleaning of data was done before analysis. Calculation of frequencies was done to describe the sample. Normality of distribution and outliers for Data was checked. The prevalence of depression was estimated with 95% confidence intervals and was calculated using the PQH-9 table of score. After obtaining people's information about their mood, we calculated every participant's score over 9 items and we obtained the total mark over 27 (9*3=27), then every participant was put under depression category based on the PHQ-9 score.

Categorical factors associated with depression were assessed using the standard Pearson's chi-square ($\chi2$) test. The fisher's exact test was used to measure this association if an expected cell count in the cross tabulation was less than 5 (sparse numbers).

Ethical considerations: The ethical clearances for the study were obtained from the University of KwaZulu Natal (REF/BO15/15); Rwanda Ministry

of Health (Ref: NHRC2015/PROT/018) and College of Medicine Health Sciences Institutional Review Board ((Ref: CMHS/IRB/66/2015). All participants voluntary consented to participate and signed the consent forms. During data collection, ethical considerations were respected by respecting the anonymity and confidentiality of participants; all participants were protected against any harm; the team of health care professionals composed by a registered nurse, a mental health nurse and medical doctor was in place to assist any person in need.

RESULTS

Demographic variables: The response rate was 88% as out of a sample size of 385 only 339 have answered the questionnaires. A high number of respondents was over 60 years 34% (n=116). About 56% (n=190) have been diagnosed with diabetes between 1 and 5 years. More than a half 56.9% (n=193) were married. The majority of respondents 78.5% (n=266) were not employed and the majority were still living with their family 87.6% (n=297). Also not few of participants 34.8 (n=198) never schooled (table 2).

Table 2. Socio-Demographic Data

Varible		Number	percent
Age	21-30 years	29	8.5
	31-40 years	58	17.1
	41-50 years	48	14.1
	51-60 years	88	25.9
	>60 years	**116**	**34.2**
Hospital	Nyamata	99	29.2
	Kibagabaga	109	32.1
	Masaka	131	38.5
Gender	Male	73	21.5
	Female	**266**	**78.4**
Disease	Diabetes type 2	**339**	**100**
	Hypertension	**21**	**6.2**
Duration of diabetes/hypertension	<1 year	49	14.4
	1-5 years	**190**	**56**
	6-10 years	67	19.7
	>10 years	33	9.7
Relationship status	Single	28	8.6
	Married	193	56.9
	Divorced	17	5.0
	Separated	1	0.2
	Widow	100	29.5
Employment status	Not employed	266	78.4
	Employed	73	21.5
Who lived with the respondents	Family	297	87.6
	Friends	12	3.5
	Live alone	30	8.8
Educational level	Never schooled	118	34.8
	Not completed primary school	83	24.4
	Completed the primary school	53	15.6
	Not completed the secondary school	51	15.0
	Completed the secondary school	27	7.9
	Have a university level	7	2.0
Type of Medication	Insulin	43	12.6
	Pills	**296**	**87.3**

The results of depression screening using PHQ-9: The participants' score about the PHQ-9 aimed at screening depression. All participants 100% (n=339) answered all questions. Every question

had a score note ranging from 0 to 3. One third of participants 29.8% (n=101) felt down, depressed and hopeless, while another third 29.8% (n=101) were having difficulties in their sleep with either trouble falling or staying asleep, or sleeping too much. Likewise, more than one third of participants 30.1% (n=102) felt tired or had a little energy. The table also indicates that more than a quarter of participants 18.9% (n=64) thought they would be better off dead or thought about hurting themselves Table 3).

Table 3: The results of depression screening using PHQ-9 (N=339).

Problems	Nearly every day 3		More than half the days 2		Several days 1		Not at all 0		Total (N=339)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Little interest in doing things	26	7.7	87	25.7	104	30.7	122	36	339	100
Feeling down, depressed or hopeless	30	8.8	**101**	29.8	87	25.7	121	35.7	339	100
Trouble falling or staying asleep, or sleeping too much	41	12.1	**101**	29.8	82	24.2	115	33.9	339	100
Feeling tired or having little energy	43	12.7	**102**	30.1	97	28.6	97	28.6	339	100
Poor appetite or overeating	24	7.1	85	25.1	87	25.7	143	42.2	339	100
Feeling bad about yourself or that you are a failure or have let yourself or your family down	21	6.2	74	21.8	73	21.5	171	50.4	339	100
Trouble concentrating on things, such as reading the newspaper or watching television	22	6.5	59	17.4	84	24.8	174	51.3	339	100
Moving or speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual	26	7.7	52	15.3	87	25.7	174	51.3	339	100
Thoughts that you would be better off dead, or of hurting yourself in some way	8	2.4	**26**	7.7	**38**	11.2	267	78.8	339	100

Prevalence of depression using PHQ-9 Scoring: The PQH-9 table score was used to measure the prevalence of depression. We found that the majority of participants 83.8% (=284) screened positive for depression. 17.9% (n=61) of those who screened positive had moderately severe to severe depression and the high number had minimal to moderate depression 81.9% (n=223). Few participants 16.2 (n=55) screened negative for depression (Table 4).

Table 4. Prevalence of depression using PHQ-9 Scoring.

Depression categories	Frequency	%
No depression	55	16.2
Minimal depression	**56**	16.5
Mild depression	**95**	28.0
Moderate depression	**72**	21.2
Moderately severe depression	**39**	11.5
Severe depression	**22**	6.4

Socio- Demographic factors associated with depression: In our findings, a statistically significant association was found between age and depression (*p=0.01*). The relative risk for depression was almost twice among respondents aged between 31-40 years old compared to those aged between 21-30 years old [odds ratio (OR) = 1.5 and 95% CI=0.51-4.54]; the relative risk was more higher among respondents aged between 41-50years old compared to those aged between 21-30 (OR = 14.9 and 95% CI = 1.73-129).

Table 5: Association between Socio-Demographic factors and depression

Socio-Demographic factors		Depression N(%)	No depression N(%)	OR (95%. CI)	P value
Age	21-30 years	22 (75.9)	7(24.1	1	
	31-40 years	48(82.8)	10(17.2)	1.53(0.51-4.54)	0.446
	41-50 years	47(97.9	1(2.1)	**14.95(1.73-129)**	**0.014**
	51-60 years	75(85.2	13(14.8)	1.83(0.65-5.16)	0.250
	>60 years	92(79.3)	24(20.7)	1.21(0.46-3.19)	0.68
Gender	Male	55 (75.3)	18(24.7)	1	
	Female	229(86.1)	37(13.9)	**2.02(1.79-5.22)**	**0.029**
Relationship status	Single	22(78.6)	6(21.4)	1	
	Married	158(81.9)	35(18.1)	1.23(0.46-3.26)	0.67
	Divorced	16(94.1)	1(5.9)	4.36(0.47-39.8)	0.19
	Separated	1(100)	0(0)	1	
	Widow	87(87)	13(13)	1.82(0.62-5.34)	0.27
Employment status	Not employed	226(85)	40(15)	1	
	Employed	58(79.5)	15(20.5)	0.68(0.35-1.32)	0.26
Who lived with the respondents	Family	252(84.8)	45(15.2)	1	
	Friends	9(75.0)	3(25.0)	0.53(0.13-2.05)	0.36
	Live alone	23(76.7)	7(23.3)	0.58(0.23-1.44)	0.24
Educational level	Never schooled	99(83.9)	19(16.1)	1	
	Not completed the primary school	73(88.0)	10(12.0)	1.40(0.61-3.19)	0.42
	Completed the primary school	45(84.9)	8(15.1)	1.07(0.43-2.65)	0.86
	Not completed the secondary school	42(82.4)	9(17.6)	0.89(0.37-2.14)	0.80
	Completed the secondary school	20(74.1)	7(25.1)	0.54(0.20-1.47)	0.23
	Have a university level	5(71.4)	2(28.6)	0.47(0.86-2.65)	0.40
Duration of diabetes/Hypertension	<1 year	39(79.6)	10(20.4)	1	
	1-5 years	158(83.2)	32(16.8)	1.26(0.57-2.79)	0.55
	6-10 years	57(85.1)	10(14.9)	1.46(0.55-3.82)	0.44
	>10years	30(90.9)	3(9.1)	2.56(0.64-10.10)	0.18
Type of medication used	Insulin	34(79.1)	9(20.9)	1	
	Pills	250(84.5)	46(15.5)	1.43(0.64-3.19)	0.37

Also, a significant association was found between gender and depression (*p=0.02*). Depression was higher in females than males. The relative risk of depression was twice among females respondents compared to males (OR = 2.02 and 95% CI = 1.07-3.82). Nevertheless no significant associations was found between depression and other socio-demographic factors. The following are *p*-values found between depression and relationship status (p=0.49); employment status (p=0.17), who lived with the respondents (p=0.28); educational level (p=0.49); duration of diabetes/hypertension (p=0.57) and types of medication used (p=0.37) (Table 5).

Additionally, binary logistic regression analysis was conducted to ascertain the relationship between depression and other variables including patients' age and gender. Taking patients aged 21-30 years as reference, patients aged 41-50 have 13 times higher risks of depression OR=13.4, (95%CI: 1.54-116.41), p=0.019. In addition, female patients are 2 times higher risks of depression compared to males, OR=1.94, (95%CI: 1.01-3.74), p=0.046 (Table 6).

Table 6. Logistic regression analysis of depression prevalence in relation patients' age and gender.

Depression	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age						
21-30	1					
31-40	1.482941	0.83221	0.7	0.483	0.493673	4.454601
41-50	13.38781	14.77341	2.35	0.019	1.53961	116.4148
51-60	1.64445	0.880053	0.93	0.353	0.576086	4.69412
>60	1.093592	0.545359	0.18	0.858	0.411503	2.906281
Gender						
Male	1					
Female	1.946858	0.649602	2	0.046	1.012317	3.744139

DISCUSSION

Prevalence of depression among diabetic patients: The aim of the current study was to determine the prevalence of depression among patients with diabetes attending three selected district hospitals in Rwanda. The results revealed that the majority of respondents 83.8% (n=284) had depression ranging from minimal to severe depression corroborating what was reported in an international study of one year done in 60 countries to determine the prevalence of depression among 245,400 patients with chronic diseases. Depression among patients with type 2 Diabetes Mellitus has been also found by different researchers in different countries and settings. Zhang, Xu, Zhao, Yin, Wang, Guo et al., (13) found a prevalence rate of 5.7% of depression among patients with type 2 diabetes. Also, Sweileh, Abu-Hadeed, Al-Jabi, and Sa'ed (14) found a prevalence rate of depression of 40% among diabetic patients in his cross-sectional done in Palestine. In their study Igwe, Uwakwe, Ahanotu, Onyeama, Bakare and Ndukuba (15) found depression to be 27.8% and 26.7% among patients with diabetes and Hypertension respectively.

Additionally, the results from a study done in Jordan revealed a prevalence rate of undiagnosed depression among diabetic patients to be 19.7% (1). Another study done in India by Raval, Dhanaraj, Bhansali, Grover and Tiwari (16) found that 41% of diabetic patients were diagnosed to have depression. Also prevalence of depression (44%) was found among patients with diabetes type 2 in a study by Khuwaja, Lalani, Dhanani, Azam, Rafique and White (17) .

Examples above show a relatively low prevalence rate of depression than one found in

our study. However, there are studies which have also found a high prevalence rate of depression in participants with diabetes Mellitus type 2 ranging from 41% to 83% (14, 18, 19)

In the study done by Khan and colleagues (20) the overall prevalence of depression among diabetes patients was 87%.

From our point of view we think that the high prevalence rate of depression in our study may be attributed to the tragic event of genocide as this has affected many Rwandans making them vulnerable to anxiety as well as depression. Besides, differences in prevalence of depression in many studies have been attributed to the use of different instruments to screen depression (14).

In the current study, the results found that 6.4% (n=22) had severe depression. In his study Aboshaiqah (21) found that 18.4% (n = 83) of participants had severe depressive symptoms. The results from American Heart Association about major depression in patients with cardiovascular diseases; cerebrovascular diseases; diabetes and cancer were 17%; 23%;27%; and 40% respectively (5). Additionally, Raval et al., (16) found that 23% of patients with type 2 met the criteria for severe depression. Compared to the above mentioned findings, our study found a smaller percentage of severe depression. This may be because diabetes was well controlled in our participants and our sample excluded participants with diabetes complications. However, these results are in accordance with those found by Arambewela and colleagues (22) who reported that major depression was found at the low prevalence rate of 4% in patients with diabetes.

In the current study, 39.1% (n= 133) had moderate to severe depression; 28% (n=95) had mild depression while 16.5% (n=56) had minimal depression. Only 16.2 (n=55) did not have depression. The results are in line with those found by Aboshaiqah (21) who noted that 25.2% of the patients in his study reported to have moderate to severe depressive symptoms, and about 13.8% of those participants reported to have experienced mild level of depression in his study to determine Correlates of depression among clients with Chronic illnesses in Saudi Arabia. Likewise, Raval et al., (16) reported 18% of

moderate depression among patients with diabetes type 2.

Factors associated with depression: The current study found a statistically significant association between age and depression (p=0.01). Older age was associated with high prevalence rate of depression. The relative risk for depression was almost twice among respondents aged between 31-40 years old compared to those aged between 21-30 years old [odds ratio (OR=1.5 and 95% CI= 0.51-4.54]; the relative risk was more higher among respondents aged between 41-50years old compared to those aged between 21-30 (OR= 14.9 and 95% CI=1.73-129) . A statistically significant association between gender and depression (p=0.02) was also found. Depression was higher in females than males. The relative risk of depression was twice among females respondents compared to males (OR = 2.02 and 95% CI =1.07-3.82). However there was no statistically significant associations found between the rest of social-demographic factors explored in our study and depression namely relationship status, employment status, who lived with the respondents, educational level, duration of diabetes/hypertension, and types of medication used. The results are in agreement with those found by Arambewela (22) who found a significant association between gender and depression((OR 2.63, 95% CI 1.26-5.46; P=0.009), . Unlike in our study, these authors found a significant association between living without a spouse (single/divorced/widowed) (OR 1.83, 95% CI 1.12-2.98; P=0.01) and lower education level (OR 1.92, 95% CI 1.14-3.22; P=0.01) with depression. . Also in their study to determine depression and its association with soci-demographic characteristics   Rahman and colleagues (23) found that females were more depressed than males. Also this was reported by Mahalli (24) who found out that females were more depressed than males. In the study Habtewold and colleagues (25) found out that age was significantly associated with depression.

The results from our study are not in accord with the results from the study done by Igwe et al., (15) who found a significant association between educational level and depression (p=<0.001). They found that depression was higher in patients with

no education. The same authors found a significant relationship between relationship status and employment status with depression (p<0.001); they found that depression was higher in respondents with diabetes mellitus if they were not married, and were not employed. Similarly, in his study Aboshaiqah (21) found that there was no significant difference between male and female patients in their depressive symptoms (t = −0.69, p = 0.488) .

Basing on the results found in this study; particularly a considerable prevalence rate of depression among respondents 83% (n=284) ; socio-demographic factors associated with this condition which are   age and gender ; we recommend for regular depression   screening among patients with diabetes as well as other chronic illnesses in Rwanda district hospitals. This will   decrease the number of the depressed or the misrecognized depressed patients who are also consulting for one or more chronic illness and subsequently offer them a better quality health care for this co-morbidity.

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