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Prevalence and Associated Factors of Depression among Type 2 Diabetes Patients on Follow-up at Referral Hospital in Rwanda

Aimable Muhoza[1] (MSc), Pacifique Igiraneza[1,2] (MSc), Emmanuel Habumugisha[3] (MSc), Emmanuel Ndagijimana[4] (MSc), Japhet Niyonsenga[1,2] (MSc), Jean Mutabaruka[1] (PhD)

1. Department of Clinical Psychology, College of Medicine and Health Sciences, University of Rwanda, Africa
2. Mental Health and Behavior Research Group, College of Medicine and Health Sciences, University of Rwanda, Africa
3. Rwanda National Commission for Children, Rwanda, Africa
4. Department of Public Health, College of Medicine and Health Sciences, University of Rwanda, Africa

Corresponding Author:
Japhet Niyonsenga,
Department of Clinical Psychology,
College of Medicine and Health Sciences,
University of Rwanda, Africa
E-mail: niyonsengajaphet74@gmail.com

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Abstract

Introduction: Despite substantial evidence showing that diabetes and psychiatric disorders influence each other in multiple ways, these two issues remain largely unstudied in Rwanda. This study therefore, was aimed to determine the predictors of depression, and the moderating factors of its association with glycaemic level.

Method: A convenient sample of 96 patients with Type 2 Diabetes (T2D) (MA=55, SD=11.63) from Butare University Teaching Hospital (CHUB) was selected for participation in this institutional based cross-sectional study. Data were collected using the standardized measures of mental disorders and social support, and analyzed using the IBM SPSS version 28.

Results: Results indicated that 83.34% of the sample had clinical levels of moderate to severe depression. Its associated factors were glycemic levels (β=.74, p<.001), psychiatric symptoms (β=.46, p<.05), gender and self-esteem (β=-.25, p<.05). Notably, self-esteem (β=.79, p =.0001), psychiatric symptoms (β=.90, p=.000), gender (β=-.32, p=.001), and poverty (β=.38, p=.00001) were significant moderators of the associations between glycemic level and depression symptoms.

Conclusion: Our findings highlight the factors of depression, and the moderators of the relationship between glycemic level and depression among patients with T2D. These findings will inform both endocrinologist and mental health professionals about the associations that should be monitored, and issues to be addressed to avoid worsening of glycemic control and depression.

Keywords: Diabetes Mellitus, Prevalence, Depression, Mental Disorders

Introduction

Chronic diseases like diabetes have considerable consequences on an individual's life and patients often need to adjust their aspirations and lifestyles. Type 2 Diabetes (T2D) is one of the leading endocrine ailments affecting approximately 6% of the adult population globally [1]. It has been recently estimated that the overall number of individuals with diabetes worldwide is projected to fluctuate from 415,000,000 people in 2015 to 642,000,000 in 2040 with above 80% of them living in developing countries [2]. Besides genetic factors, social factors such as extreme poverty, jobless, unstable housing and loneliness which are related to mental illnesses may account for elevated vulnerability of developing T2D in developing countries [3]. Worryingly, T2D has alarming morbidity and mortality because of its detrimental effects on kidney, optic nerve, heart and blood vessels, in addition to amputations [4]. In 2015, there were approximately 5.0 million deaths by diabetes worldwide [2].

The principal treatment of T2D is Glycemic Control (GC) with glycosylated hemoglobin A1c (HbA1c) as its standard unit [5]. HbA1c gives an exact ration of average GC over the last twelve weeks where HbA1c less than 7% indicates a good GC. Self-management tasks for patients with diabetes include an adequate diet, physical activity, glucose monitoring, and medication administration [6]. When the quality of life is damaged, the rate of complications rises and life expectancy is decreased. The cost of diabetes treatment is extremely high for both patients and government health sectors and does not usually lead to positive treatment outcomes [7].

Some people are able to adapt to this new situation, but others have prolonged distress and can develop psychiatric disorders [8, 9]. The repeated co-occurrence of T2D and psychiatric disorders has been documented for a number of centuries and its factors are numerous [10, 11]. As the responsibility of the individuals with T2D account for 95% of disease management, a diagnosis of T2D can significantly increase levels of anxiety symptoms, psychiatric symptoms, depressive symptoms, and low self-esteem [8]. Additionally, poorer GC [12] and resultant increases in diabetes-related complications [5], have been associated with the presence of a psychiatric disorder. Compared to the general population, individuals with diabetes have 50% to 100% risks of developing depression[13]. It seems likely, but is yet to be demonstrated, that glycemic level may moderate the relationship between psychiatric symptoms, anxiety, low self-esteem and depression in course of disease management [8].

Despite substantial evidence showing that diabetes and psychiatric disorders influence each other in multiple ways, the two issues remain largely unstudied in Rwanda. To the best of our knowledge, a single study was conducted in Rwanda to explore the rate of depression and their socio-demographic factors among patients with T2D [14]. However, the authors explored a few factors of depression (i.e. gender and age). Several factors that have theoretical importance in depression such as glycemic levels, social support, self-esteem, anxiety, psychiatric symptoms etc., were not explored among Rwandan with T2D [14]. The presence of depression in patients with diabetes worsens the prognosis of diabetes, increases the non-compliance to the medical treatment, decreases the quality of life and increases mortality [10]. On the other hand, depression may increase the risk of developing T2D up to 60% [15]. It seems that there is a bidirectional association between diabetes and depression, a complex relation that might share biological mechanisms, whose understanding could provide a better treatment and improve the outcomes for these pathologies [10]. Therefore, this study was aimed to determine the predictors of depression, and the moderating factors of its association with glycemic levels among adults in Rwandan with T2D. Adult patients with T2D are the most vulnerable population category to developing depression in Rwanda. According to Mukeshimana and Chironda [14], the relative risk for depression was almost twice in participants aged between 31-40 years (OR=1.5) and 15 times between 41-50 years (OR = 14.9), compared to those aged between 21-30 years old. This age difference may be due to the exposure to the Genocide against the Tutsi in 1994 by adult population.

In the view of the existing literature, we hypothesized that predictors of depression in patients with T2D would be low income (poverty), lower social support, anxiety, low self-esteem, psychiatric symptoms and glycemic level. We further hypothesized that low income (poverty), lower social support, anxiety, low self-esteem, and psychiatric symptoms would moderate the relationship between the level of glycemic and depression symptoms.

Method

Participants to this cross-sectional study were diagnosed with T2D and were treated in the Internal Medicine Department at CHUB. The sample was made up of 96 patients (65 women and 31 men, age ranged from 33 to 86 years (MA=55, SD=11.63)). The inclusion criteria included obtaining a written informed consent, Rwandan nationality, having a diagnosis of T2D, and age between 33 to 86 years. The exclusion criteria included a history of mental disorders. This study was approved by the CHUB directorate and the Institutional Review Board of College of Medicine and Health Sciences approved the research proposal (No 322/CMHS IRB/2016). Before data collection, the study was fully explained to the participants followed by signing consent forms.

The tools used in this study were as follows:

Structured Socio-demographic Questionnaire: This scale was a self-designed questionnaire used to collect socio-demographic data (socioeconomic status, chronological age, sex, marital status, occupation, and where participants live).

Beck Depression Inventory-13 Items: This scale has been developed by Beck to evaluate the depth of depressive symptoms [16]. It can be used widely, and its psychometric properties in terms of reliability and validity are good in both adult and adolescents' populations. The original scale consisted of 21 items measuring cognitive, affective, behavioral, and somatic components of depression [17]. Later, a 13-item version has been created with the aim of screening and it has been shown to be a valid measure to assess depressiveness [18]. Each item is scored on a four-point Likert scale varying from 0 to 3 [18]. The total score ranges from 0 to 39 with a score of ≥ 20 indicating a severe depression. The Cronbach's alpha was .91 in the current study.

The Symptom Checklist (SCL-90-R): It is a 90-item self-administered questionnaire developed by Derogatis [19] to assess general psychiatric symptoms during last seven days before the time of assessment [20]. The SCL-90 includes 90 symptoms and evaluates nine main symptom dimensions (somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism). Rating of items varies from 0 (not at all) to 4 (extremely), with a total score fluctuating from 0 to 360. A higher score on this scale indicates high psychiatric symptoms. The Cronbach's alpha was .96 in the current study.

The State-Trait Anxiety Inventory: This scale has been developed by Spielberger [21] to measure anxiety from the perspective of states versus traits. The state measurement assesses how the individual feels right now or at this moment [22]. It is a 40-item questionnaire that was used in this study to measure the presence and severity of the current symptoms of anxiety and a generalized propensity to be anxious within our participants [23]. The tool had two 20-item subscales: S-Anxiety subscale assessing intensity of current feelings at this moment and T- Anxiety subscale assessing frequency of feelings. The items are rated on a four-point Likert scale fluctuating from not at all (1) to very much (4) for S-Anxiety subscale and almost never (1) to almost always (4) for T-Anxiety subscale with an overall score range between 20 and 80. The internal consistency was α=.78 for the S-Anxiety and α=.70 for T-Anxiety subscales in the current study.

The Rosenberg's Self-Esteem Scale: This is one of the most widely used self-esteem measures in social science research. It has been developed by Rosenberg [24] in 1965 and has been widely used in psychology, mental health and psychiatry. The scale is composed of 10-items that were presented on a four-point Likert scale (strongly agree (0) to strongly disagree (3)). Five of the items are reverse coded (3, 5, 8, 9, and 10) and the score reported is the total, which ranges from 0 to30. The internal consistency in the current study was α=.88.

The Multidimensional Scale of Perceived Social Support (MSPSS): This scale was developed by Zimet et al. [25]. MSPSS is a 12-item that has been used to evaluate perceived social support and is rated on a seven-point Likert scale [26], ranging from very strongly disagree (1) to very strongly agree (7). It measures social support from three sources: family (items 3, 4, 8, and 11), friends (items 6, 7, 9, and 12), and significant others (items 1, 2, 5, and 10) with the overall score ranging between 12 and 84. The reliability in the current study was α= .91.

Medical Conditions and Complications of Diabetes: Medical information was obtained from the participants and their medical records. Variables we were looking for were the glycated haemoglobin (HbA1c), the duration of disease, complications of diabetes (retinopathy, neuropathy, foot ulcers, renal failure, heart disease and stroke), treatment (insulin or pills) and history of psychiatric disorder.

Data were analysed using the Statistical Package for the Social Sciences (SPSS version 28) and STATISTICA version 7 for data coding and processing. We conducted correlation analysis to describe the relationships between depression and the studied variables and hierarchical multiple regression analysis to test further association between variables. For moderation analysis, we centered our variables (glycemic levels, poverty, gender, psychiatric symptoms and self-esteem) and computed the cross-product interaction term to minimize multicollinearity with the interaction term [27].

Results

Symptoms of depression were correlated with glycemic levels, renal failure, poverty, psychiatric symptoms, anxiety, self-esteem, perceived social support and sex (Table 1).

Table 1. Inter-correlations between Symptoms of Depression (1), Glycemic Level (2), Renal Failure (3), Poverty (4), Psychiatric Symptoms (5), State Anxiety (6), Trait Anxiety (7), Self-Esteem (8), Perceived Social Support (9), and Gender (10)

Scales	1	2	3	4	5	6	7	8	9	10
1. Depr	–	.73**	.19	.20*	.85**	-.43**	.02	-.66**	-.47**	-.36**
2. Gly level		–	.07	.22*	.55**	-.31**	.06	-.46**	-.39**	-.19
3. RenF			–	-.09	.16	-.14	-.07	-.08	.03	.08
4. Pov				–	.15	-.21*	-.12	-.16	-.24*	-.10
5. SCL					–	-.29**	.11	-.56**	-.44**	-.44**
6. StAnx						–	.43**	.48**	.32**	.11
7. TrAnx							–	.09	.13	-.08
8. SelfE								–	.58**	.29**
9. PScS									–	.25*
10. Gend										–

*p< .05, **p< .01

Depr: Beck Depression Inventory–13 items total score; **Gly level**: **Glycemic level**–Score of HbA1c; **RenF**:renal failure–yes or no; **Pov:** poverty–yes or no; **SCL:** Symptom Checklist 90-R total score; **StAnx:** StateAnxiety–20 items total score; **TrAnx:** Trait Anxiety–20 items total score; **SelfE:** self-esteem–10 items total score; **PScS** perceived social support–12 items total score, and **Gend:** gender–female or male.

Moreover, variables found to be associated with depression were entered in the hierarchical multiple regression model to examine the predictors of depression symptoms (Table 2). To ensure there was no violation of the assumption of normality, linearity, multicollinearity and homoscedasticity, preliminary analyses were performed. In the first step, poverty and gender were entered, glycemic levels in second step, while state of anxiety, perceived social support, psychiatric symptoms, and self-esteem were entered in step three.

In the first step, poverty and sex explained only 16.2% of the total variance in the current symptoms of depression (F (2, 93) = 8.98, p<.001). However, only gender was a significant predictor of depression symptoms.

In step two, glycemic levels (HbA1c) was entered and the model explained an additional 66.2% of the total variance of symptoms of depression (F (3, 92) = 60.17, p<.001). Both gender and diabetes were significantly linked to symptoms of depression.

In step three, psychiatric symptoms, state of anxiety, self-

esteem, and perceived social support were considered. The model explicated 88% of the total variance of symptoms of depression (F (7, 88) = 90.36, p <.001). Among the seven considered variables, only glycemic levels, psychiatric symptoms and self-esteem significantly predicted depression symptoms.

In this stage the cross product (glycemic levels * poverty, diabetes * gender, diabetes * psychiatric symptoms, glycemic levels * self-esteem) was entered in a regression analysis predicting depression.

Results showed that the interaction of glycemic levels with gender was significant (B= -.81, R= .32, R^2= .10 and β = -.32, (t= -3.31, p< .01)), explaining 10% of the total variance in symptoms of depression. The interaction between glycemic levels and poverty was significant (B = .78, R=.38, R^2= .15 and β = .38, (t = 4.09, p< .05)), explaining 15% of the total variance in symptoms of depression. The interaction between glycemic levels and psychiatric symptoms was significant (B = .01, R = .90, R^2 = .82 and β = .90, (t = 20.71, p< .01)), explaining 82% of the total variance in symptoms of depression. The interaction between glycemic levels and self-esteem was significant (B = .65, R = .79, R^2 = .63 and β = .79, (t = 12.71, p< .01)), explaining 63% of the variance in symptoms of depression.

Table 2. Hierarchical Multiple Regression Analysis of Independent Variables to Depression

Variables	*B*	*SE B*	β
Step 1			
Poverty	3.72	1.89	0.18
Gender	-7.14	2.01	-0.33*
Step 2			
Poverty	0.85	1.23	0.04
Gender	-3.69	1.32	-0.17*
Diabetes	3.67	0.31	0.74*
Step 3			
Poverty	0.33	0.78	0.01
Gender	-0.14	0.87	-0.007
Diabetes	1.99	0.23	0.40*
Psychiatric symptoms	0.10	0.01	0.46*
State anxiety	-0.06	0.07	-0.03
Self-esteem	-0.53	0.11	-0.25*
Perceived social support	0.03	0.03	0.04

R^2 = .16 for step 1; R^2 = .66 for step 2; R^2 = .87 for step 3 (p < .001)

*p < .05

Discussion

The aim of this study was to determine the prevalence and predictive factors of depression in patients with T2D attending CHUB. Results indicated the alarming prevalence of depression in the research participants. This rate is higher than those reported in previous studies [28, 29], and raises questions in relation to the health of people with diabetes, but also in relation to its socio-economic impact on their lives and for their families. In individuals with type 2 and type 1 diabetes, depression has a synergistic impact that raises the risk for micro-vascular and macro-vascular problems, increases hyperglycemia, and predicts higher mortality [10] . Both diabetes and depression reduce the quality of life for an individual, but together they have a more negative impact. Both diagnoses should be identified in a person and treated concurrently due to the detrimental impact on health and the rise in complications, in order to lessen depression and improve diabetes management [10]. Depression, however, remains under-diagnosed and untreated in patients with diabetes, with fewer studies exploring its associated factors.

As hypothesized and consistent with previous studies, further analysis revealed that gender [30], self-esteem [31], psychiatric symptoms [32] and poverty [33] were predictive factors of depression in patients with T2D and they moderated the relationship between glycemic level and depression. However, renal failure, perceived social support and anxiety did not predict depression in our population. Recent research has established a bidirectional causal relationship between poverty and depression, and isolated underlying mechanisms, which can guide effective policies to protect the mental health of those living in poverty [33]. It is well known that financial hardship contributes to mental illness, in this case, depression. People with diabetes may face negative income shocks such as poor harvests caused by insufficient rainfall or job losses that affect mental health. In contrast, randomized trials show that cash transfers and larger antipoverty initiatives lessen depression. This causal chain is mediated by several ways. Inequality is linked to erratic income and spending. Worries and uncertainties that arise can worsen mental health. Thus, offering insurance for health, job, or the weather as well as other methods of absorbing shocks may reduce depression in the current sample. The poor people are more vulnerable to environmental pressures including pollution, temperature extremes, and difficult sleeping conditions because they live in substandard housing in low-income areas, which can result in mental illness [33].

Self-esteem was significantly linked to symptoms of depression and this would result from the level of participants' quality of life and the way they interpret the disease. Consistently, Rivera-Hernandez found that people with diabetes who had low self-esteem could develop depression [31]. Some of our participants

reported thinking to die very soon as they were losing some of their body parts and others knew that they could do nothing to heal diabetes because they had no sufficient financial means. Similarly, authors found that hopelessness and poor quality of life may cause cognitive vulnerability and influence the way individuals perceive the world and their future, which in return foster them to become re-traumatized and depressed [34]. Considering our participants' claims and reports on how they coped with life stressors, the future or enjoying the life was not ensured. They were struggling with diabetes and its costs not only financially but also socially and psychologically.

Gender was another predictive factor of depression in patients with diabetes. In congruence with our findings, scholars have shown that female participants were more depressed than males [35, 36]. This would result from an over-representation of women in our sample. However, different studies have also found a significant difference between the prevalence of depression in women with diabetes compared to men with diabetes [37]. Some bio-psycho-social factors like adverse experiences, sociocultural roles, psychological attributes, biological factors (hormones and poor social support) were identified as major determinants for higher prevalence of depression in women [38].

The presence of psychiatric symptoms among predictive factors of depression in the study population shows how much psychological distress due to diabetes has an impact on patients. Scholars also found that the previous mental status was a predictor of depression in people with diabetes [10]. Among psychiatric symptoms, anxiety symptoms have been identified as a predisposing factor to depression in patients with diabetes [10]. Some of the participants reported that sleepless nights and the unaffordable cost of diabetes regime may predispose them to think of being unworthy to continue living in the world that denied being friendly to them. Exposure to diabetes and its characteristics seems to be a specific category of trauma exposure that could intensify the risk for stress reactions and subsequent psychiatric disorders. Mutabaruka et al. pointed out that general psychiatric symptoms might worsen the distress among people reporting traumatic reactions [32].

In overall, it seems reasonable to treat both illnesses concurrently when depression is discovered in a patient with diabetes. Scholars have indicated that the response to antidepressant medication is often visible within 2-4 weeks, but improvements in glycemic control and levels of HbA1C take several months to stabilize [10]. Researchers have assumed that patients who are happier may adhere to their diabetes therapy better [10]. They also suggested a paradigm for managing diabetes and depression that was graduated in accordance with the severity of depression.

The limitations of this study were its "cross-sectional design" that prevents us to assume causal relationships between depression and variables, an overrepresentation of women in our study population and also the small sample size.

Conclusion

Our findings highlight that glycemic levels, psychiatric symptoms, gender and self-esteem were associated with depression, and that self-esteem, psychiatric symptoms, gender, poverty were significant moderators of the associations between glycemic level and depression symptoms among patients with T2D. Depression and type 2 diabetes are two insidious diseases that have detrimental impact on individual, family and socioeconomic. Therefore, comprehensive and inclusive care (that is bio-psycho-social approach) is necessary to alleviate the suffering of our population and improve their quality of life. Knowledge of the predictive factors of depression in people with diabetes is a major asset in the prevention, detection and management of depressive symptoms. As such, these findings will inform both endocrinologist and mental health professionals about the associations that should be monitored, and issues to be addressed to avoid worsening of glycemic control and depression. Future research need to be carried out with a larger sample size and future programs or interventions should focus on social support for patients with diabetes in precariousness, and on promoting positive thinking and self-esteem reinforcement.

Conflict of Interest

The authors declare no conflicts of interest.

Ethical Approval

The present study was approved by CHUB directorate and "the Institutional Review Board of College of Medicine and Health Sciences" approved the research proposal (No 322/CMHS IRB/2016). In order to observe the ethical principles of research and to respect the rights of the participants, the research aims and its process were explained to all the participants. The option of leaving the study at any point was also introduced. They were ensured that their information will always be confidential and the collected data will be published without revealing any personal information.

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