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Title Page

Symptoms of depression among patients attending a diabetes care clinic in rural western Kenya

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Conflict of Interest Statement

Sonak Pastakia has received fees for serving as a speaker and consultant for Abbott within the last three years.

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Abstract

Objective: The prevalence of diabetes in sub-Saharan Africa is rising, but its relationship to depression is not well-characterized. This report describes depressive symptom prevalence and associations with adherence and outcomes among patients with diabetes in a rural, resource-constrained setting.

Methods: In the Webuye, Kenya diabetes clinic, we conducted a chart review, analyzing data including medication adherence, hemoglobin A1c (HbA1c), clinic attendance, and PHQ-2 depression screening results.

Results: Among 253 patients, 20.9% screened positive for depression. Prevalence in females was higher than in males; 27% vs 15% (p=0.023). Glycemic control trends were better in those screening negative; at 24 months post-enrollment mean HbA1c was 7.5 for those screening negative and 9.5 for those screening positive (p=0.0025). There was a nonsignificant (p=0.269) trend toward loss to follow-up among those screening positive.

Conclusions: These findings suggest that depression is common among people with diabetes in rural western Kenya, which may profoundly impact diabetes control and treatment adherence.

Keywords

Diabetes, Depression, Resource-constrained, Kenya, sub-Saharan Africa

Introduction

Depression and diabetes mellitus are two chronic disease states that have a profoundly negative impact on quality of life and overall life expectancy [1]. They frequently co-occur, and relationships between both conditions are bidirectional [2]. Some data suggest that the burden and emotional impact of managing a chronic disease like diabetes may lead to development of mental health problems such as depression [3]. Conversely, people with depression may develop behavioral factors that lead to an overall lack of self-care, thereby increasing the risk of developing diabetes [4]. . There is more than a threefold increase in the prevalence of depression in people with type 1 diabetes, and nearly a two fold increase in people with type 2 diabetes. However, there is very limited data on the prevalence of comorbid depression and diabetes in sub-Saharan Africa [5].

Both hypotheses present serious implications in the management of these comorbid disease states. If diabetes is caused or exacerbated by depression, then proper management of diabetes cannot exist without addressing depressive symptoms. Patients with diabetes experiencing significant depressive symptoms are less likely to engage in diet and exercise recommendations than are those without depressive symptoms, and have lower medication adherence than non-depressed counterparts [6]. Comorbid depression profoundly impacts diabetes self-management and treatment adherence, and is associated with significant risk of complications including stroke and myocardial infarction. Overall, comorbid depression in individuals with diabetes is associated with a 1.5-fold increase in mortality risk as compared with those without depression [7].

As such, co-management of diabetes and depression is critical; in high income countries programs have been established to co-manage depression and diabetes, but such

programs are virtually nonexistent in sub-Saharan Africa (SSA) [8]. Globally, mental illnesses such as depression have become an increasingly prevalent component of the overall burden of disease [9]. Depression is the second leading cause of disability in young to middle aged adults in low and middle income countries, surpassed only by HIV/AIDS [10]. Despite this high burden and increasing global healthcare strain, limited infrastructure exists to confront these issues. In Kenya, approximately 0.1% of the national healthcare budget is directed toward mental health care [11].Generally, there is underdiagnosis of psychiatric illnesses among patients attending medical facilities in Kenya. This calls for increased awareness among healthcare workers, as well as the use of screening tools that are quick and easy to use in busy clinical settings [12]. This study seeks to identify the comorbidity of depression in a rural population of patients receiving care within a public sector hospital. The Webuye diabetes clinic is located in Bungoma County, western Kenya. Webuye includes both rural and semi-urban areas, with a population of around 230,252 people. It is approximately 380 km west of the capital city, Nairobi. The diabetes clinic is affiliated with Academic Model Providing Access to Healthcare (AMPATH), and serves over 650 patients [13]. AMPATH, a partnership between Indiana University School of Medicine, Moi University School of Medicine, and Moi Teaching and Referral Hospital in Eldoret, Kenya, has developed one of Africa's largest and most effective HIV/AIDS prevention and treatment programs [14]. AMPATH has since expanded into one of the first comprehensive chronic disease management programs in SSA.

This study was approved by the Kenyan based Moi University Institutional Research and Ethics Committee and the Institutional Review Board of the North American investigators.

Methods

This study describes prevalence of depressive symptoms as measured by questions from the ultrabrief depression screening tool, the Patient Health Questionnaire 2 (PHQ-2) [15], and describes associations between depressive symptoms and adherence to medications and clinic visits in a cohort of patients with diabetes in a rural, resource-constrained clinic setting in western Kenya.In this retrospective chart review, baseline demographic information was collected including age, age at diabetes diagnosis, gender, substance use, food security, travel time to the clinic, income, presence of comorbid diseases including HIV, tuberculosis, or hypertension, and family history of diabetes or cardiovascular disease. Responses to two questions from the PHQ-2, “During the last month have you been feeling down, depressed or hopeless?” and “During the last month have you often been bothered by having little interest or pleasure in doing things?” were recorded. Patients were considered to screen positive for depression if they answered ‘yes’ to either question. Longitudinal diabetes management data were also collected, including current diabetes medication regimen and most recent HbA1c.

Wilcoxon rank-sum and Mann-Whitney tests were used for statistical analysis of non-parametric data, and Fisher’s exact test was used for dichotomous data. A p-value of <0.05 was accepted as statistically significant. These tests were used to identify clinical

and demographic differences between patients with and without a positive screen for depressive symptoms.

Results

Data from 253 patients were collected, of which 55% were female. Mean age was 57.6 years (depression screen-positive 58.1 years, depression screen-negative 55.8 years, p=0.303) with a mean age of 50.9 at diabetes diagnosis (depression screen-positive 50.9 years, depression screen-negative 47.9 years; p=0.160). Overall, 20.9% screened positive for depression (Table 1), with a statistically significant difference between the proportion of women (27%) and men (15%) screening positive (p=0.023)There were no significant differences between those with and without depressive symptoms with respect to HIV status, presence of tuberculosis, comorbid hypertension, family history of cardiovascular disease or diabetes, alcohol use, or current diabetes medications.

Regarding diabetes management, 13.2% of patients who screened positive for depression were lost to follow-up at 12 months following initial survey, as compared with 7.5% of patients who screened negative and 8.7% of all diabetes clinic patients (p=0.269). Significant differences in HbA1c between the two groups were not detected until 24 months following initial survey; however, there was a consistent trend towards higher Hba1cs amongst patients screening positive for depression as demonstrated in Figure 1. Baseline HbA1c for depression screen-negative patients was 9.9 compared to 10.2 for those screening positive. After 24 months, patients who obtained regular HbA1cs demonstrated a significant difference, as patients without depressive symptoms at

115 baseline (N=29) averaged an HbA1c of 7.5 and those who screened positive (N=9)
116 averaged 9.5 ($p<0.05$).
117
118 **Discussion**
119 These findings suggest that depressive symptoms are common among patients with
120 diabetes in rural western Kenya. In North American and European populations, comorbid
121 depression has consistently been found to impact diabetes adherence, severity, and
122 outcomes, and depression treatment interventions among patients with diabetes improve
123 medication adherence and diabetes outcomes [16]. A higher proportion of women were
124 screen positive for depression compared to men and this is thought to be due in part to a
125 reporting bias as male patients tended to be more reluctant to report symptoms consistent
126 with depression. The validity of this finding of a statistically significant difference
127 between men and women needs to be further evaluated before conclusive findings are
128 reported on this gender disparity. Though unable to demonstrate significant differences in
129 diabetes severity as indicated by most recent HbA1c, our findings suggest that those with
130 depressive symptoms trend toward a higher mean HbA1c and more loss to follow up than
131 do those without depressive symptoms.
132 This study has several limitations. Firstly, the retrospective nature and small sample size
133 limits the power to detect true associations with HbA1c or loss to follow up amongst
134 patients with and without depressive symptoms. Further, the PHQ-2 has not been widely
135 validated in SSA populations and may therefore not be a precise indicator of whether
136 individuals screening positive would meet diagnostic criteria for major depressive
137 disorder. However, these questions are quick, easy to implement in busy clinic settings,

and positive response to one or both questions indicates distress that likely impacts individuals' diabetes disease severity and ability to engage in treatment.

Further research is needed to investigate prevalence of depression and relationships between depression, adherence to medication and clinic visits, and outcomes in this population. Larger studies of depression among people with diabetes and other chronic diseases in SSA are indicated to better understand relationships between these comorbid illnesses, as well as the growing discrepancy between the burden of these conditions and the infrastructure in place to treat them. As chronic disease management programs are rolled out in western Kenya and other resource-constrained settings, it is important to identify and address depression and other mental illnesses, not only as significant sources of distress and disability in their own right, but as potential barriers to adherence so that treatment interventions may be implemented efficiently and effectively.

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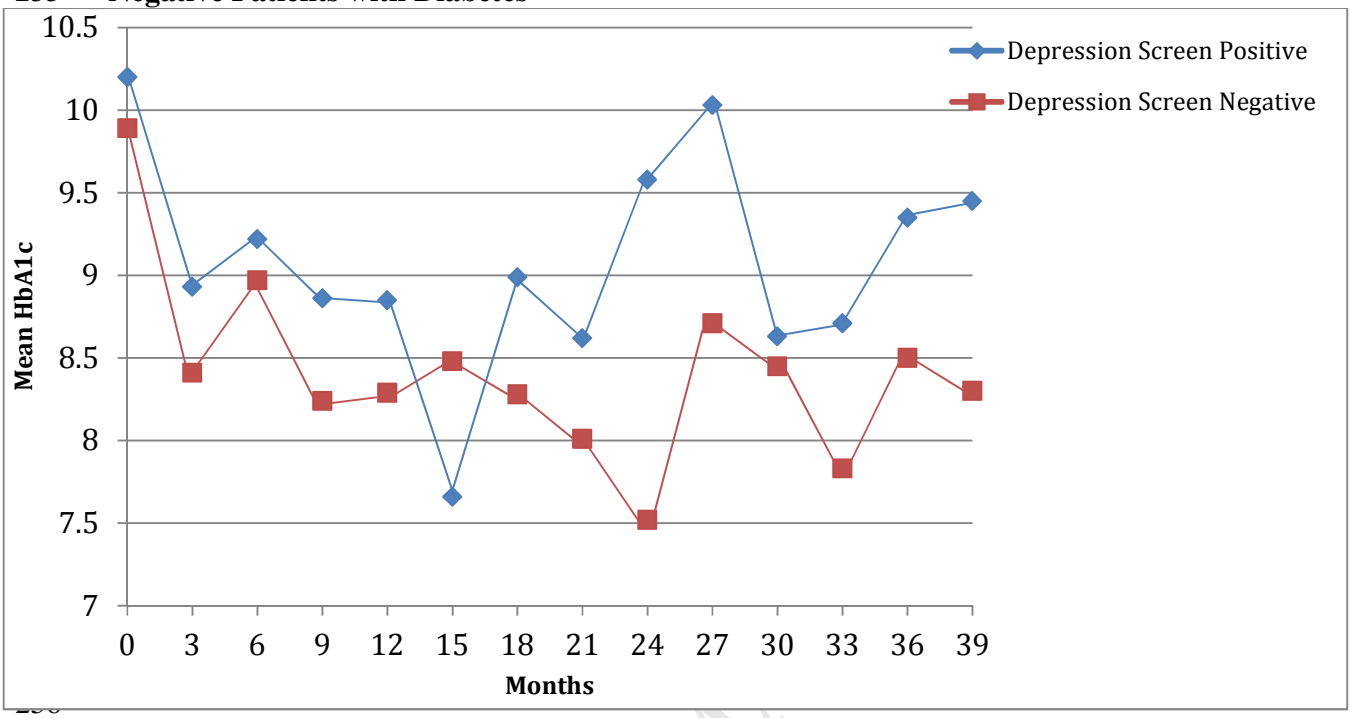
Table 1: Factors associated with positive depression screen among patients with diabetes

Variable (n)	Depression screen positive n (%)	p
Gender		0.023*
Male (113)	17 (15.0)	
Female (140)	38 (27.1)	
TB History		0.623
Positive (6)	1 (16.7)	
Negative (243)	52 (21.4)	
Aware of HIV status		0.565
Yes (89)	19 (21.4)	
No (159)	34 (21.4)	
If aware, positive HIV result		0.654
Yes (4)	1 (25.0)	
No (79)	18 (22.8)	
Hypertension		0.422
Yes (84)	17 (20.2)	
No (157)	35 (22.3)	
Smoking history		0.183
Yes (7)	0 (0.0)	
No (242)	53 (21.9)	
Chew tobacco, miraa, or khat		1.000
Yes (3)	0 (0.0)	
No (138)	28 (20.3)	
Alcohol use		0.311
Yes (26)	4 (15.4)	
No (223)	49 (22.0)	
Family history of DM		0.445
Yes (84)	17 (20.2)	
No (164)	36 (22.0)	
Has a caretaker		0.380
Yes (164)	36 (22.0)	
No (78)	15 (19.2)	
Food insecure		0.058
Yes (83)	23 (27.7)	
No (166)	30 (18.1)	
Loss to follow up (>12 months)		0.269
Yes (22)	15 (68.2)	
No (231)	185 (80.1)	
Travel time to clinic (>30 mins)		0.601
Yes (48)	32 (66.7)	
No (191)	152 (79.6)	

* $p < 0.05$ statistically significant

Figure 1: HbA1c Trends Between Depression Screen Positive and Depression Screen Negative Patients with Diabetes



Months	0	3	6	9	12	15	18	21	24	27	30	33	36	39
Depression Screen Positive, Mean A1c	10.20	8.93	9.22	8.86	8.85	7.66	8.99	8.62	9.58	10.03	8.63	8.71	9.35	9.45
N	39	12	23	9	14	9	11	10	9	8	6	7	2	2
SD	3.15	1.48	2.85	2.09	0.15	0.85	2.46	1.94	1.98	2.18	2.43	1.93	4.45	4.45
Depression Screen Negative, Mean A1c	9.89	8.41	8.97	8.24	8.29	8.48	8.28	8.01	7.52	8.71	8.45	7.83	8.50	8.30
N	169	54	71	69	61	56	56	37	29	30	19	12	3	4
SD	2.90	1.99	2.39	2.04	2.11	2.53	2.11	1.90	1.06	2.26	2.08	2.08	1.41	2.57