Prevalence and associated factors of depression among diabetic outpatients attending diabetic clinic at public hospitals in Eastern Ethiopia: A cross-sectional study

Mohamed Ebrahim[1], Dawit Tamiru[2] (iD),
Behailu Hawulte[3] (iD) and Tadesse Misgana[4] (iD)

Abstract

Introduction: Depression is one of the most common comorbid psychiatric disorders among diabetic patients. Depression among diabetic people has led to poor treatment adherence, defective treatment outcomes, and consequently worsened quality of life. However, there is a limited study conducted to assess the magnitude and factors associated with depression among diabetic patients in Ethiopia including this study area.

Objective: This study aimed to assess the prevalence and factors associated with depression among adult diabetic outpatients attending diabetic clinic in Eastern Ethiopia.

Methods: An institution-based cross-sectional study was conducted among 407 adult diabetic outpatients on treatment in Ethiopia in 2020. Patient Health Questionnaire-9 was used to assess depression among randomly selected samples. Bivariate and multivariate logistic regression was fitted to identify factors associated with depression among diabetic outpatients. A p value less than 0.05 with a 95% confidence interval was considered statistically significant.

Results: The overall prevalence of depression among diabetic outpatients was found to be 48.9% (95% confidence interval: 44.2%, 53.4%). Being female (adjusted odds ratio = 1.50, 95% confidence interval: 1.39, 2.73), Khat chewing (adjusted odds ratio = 1.88, 95% confidence interval: 1.22, 2.93), having poor and moderate social support (adjusted odds ratio = 1.79, 95% confidence interval: 1.07, 2.98 and adjusted odds ratio = 1.90, 95% confidence interval: 1.14, 3.17, respectively), taking both oral hypoglycemic agents and insulin medication (adjusted odds ratio = 1.33, 95% confidence interval: 1.13, 2.80) and duration of diabetes mellitus for more than 6 years (adjusted odds ratio = 5.40, 95% confidence interval: 3.42, 8.14) were significantly associated with depression.

Conclusion: This study revealed a relatively high prevalence of depression in diabetic outpatients. A lesser level of social support, taking oral and insulin treatment regimes, longer duration of illness, using *Khat*, and being female were associated with depression among diabetic outpatients. Therefore, early screening and identification of such factors could help ameliorate some of the deleterious effects of depression in diabetic outpatients.

Keywords

Depression, diabetes mellitus, prevalence, Ethiopia

Introduction

Diabetes mellitus (DM) is a heterogeneous group of metabolic diseases that are characterized by chronic hyperglycemia (high blood sugar) and disturbances in carbohydrate, lipid, and protein metabolism resulting from defects in insulin secretion and/or insulin action.[1] It is a devastating illness that needs lifelong treatment and significantly increases the risk of serious, long-term complications.[2] In 2019, the prevalence of diabetes was projected to be 9.3% (463 million) and expected to rise to 10.2% (578 million) by 2030

[1]Jenela Health Center, Harar, Ethiopia
[2]Department of Midwifery, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia
[3]School of Public Health, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia
[4]Department of Psychiatry, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

Corresponding author:
Tadesse Misgana, Department of Psychiatry, College of Health and Medical Sciences, Haramaya University, Po Box 138, Dire Dawa, Harar, Ethiopia.
Email: tadessemisgana25@gmail.com

worldwide.[3,4] There is substantial evidence that diabetes is an epidemic in many low- and middle-income countries (LMICs), where it is a home for more than 75% of the diabetic population.[5] The global burden of disease study predicted that diabetes will take 10th place with 2.3% of the overall disease burden as a percentage of the overall disability-adjusted life years by 2030.[6]

About 15%–20% of diabetic patients are expected to have moderate to severe depression and of this, 50%–75% of patients remain under diagnosed.[7–10] In Ethiopia, according to World Health Organization (WHO) estimation, the number of diabetics cases will increase from 800,000 to 1.8 million by the year 2030[11] and a prevalence is as high as 8% in patients with other co-morbid illnesses.[12] A recent review reported a depression rate of 39.7% among diabetic patients in Ethiopia.[13]

Thinking about depression among diabetic patients in a broader way, bearing in mind other factors associated with DM that have a role in increasing the possibility of developing depression is the cornerstone. In one study, gender, having diabetes complications, and being on insulin treatment have been associated significantly with higher occurrence of depression.[14,15] Also, higher body mass index and poor glycemic control have been associated with an increased risk of major depression among diabetic patients.[16] In regard to age, there are studies that reported that age is linearly related to greater depression.[17,18] On the other hand, a study reported that middle-aged diabetic patients have the highest risk of developing depression,[19] while others suggested that the younger the age, the higher the prevalence to develop depression.[14,20] To add to the confusion, several studies stated that there is no relationship between age and depression among diabetic patients.[21,22]

Education has also been considered as a significant factor to affect the prevalence of depression among diabetic patients; some studies reported that low educational status has been associated with an increased depression rate.[16,23] However, other studies failed to show a significant relationship between the educational level and depression among diabetic patients.[24] Other factors contributing to the development of depression among diabetic patients include marital status, work status, family income, medical co-morbidity, anxiety, quality of life, duration of illness, fear of complication, substance use, lack of physical activity, and poor social support.[25–28]

Depression has a profound adverse effect on the quality of life, treatment adherence and outcome, self-care, and health care costs in patients with diabetes.[29] It is evidenced that the co-morbidity of depression with a chronic illness incrementally deteriorates health outcomes as compared to having depression or chronic illness alone.[30,31] Most people with diabetes were undiagnosed and left untreated for their comorbid depressive disorder.[32] An unprocessed ill-health state is specifically significant in Africa, where health care systems primarily focus on communicable diseases than non-communicable diseases like diabetes.[33,34]

Although developing countries carry a higher burden of diabetes and comorbid depression with diabetes, very little information is available about the magnitude of depression among diabetic patients and factors associated with it. Identifying factors of depression in patients with diabetes will help to develop strategies and interventions for treatment and mitigate the psychological distress of diabetic patients. To the level of investigators' understanding, no studies have been done to find out the magnitude and predictors of depression among diabetic patients in the study area. Therefore, this study was aimed to determine the prevalence of depression and its associated factors among diabetic outpatients attending diabetic clinic at public hospitals in Ethiopia.

Materials and methods

Study design

An institution-based cross-sectional study was carried out.

Study setting

The study was conducted at public Hospitals in Harar, eastern Ethiopia from June 01 to July 01, 2020. Harar city is 526 km away from Addis Ababa, the capital of Ethiopia. The total population of Harar town is 183,415 (91,099 (49.7%) females and 92, 316 (50.3%) males). Of the total population, 54% were urban dwellers, and the rest were rural dwellers.[35] In Harar, there are two public hospitals, one police hospital, one private general hospital, one medical center, eight health centers, and 26 health posts. The two public hospitals have a total of 819 patients with diabetes on treatment, 421 in Hiwot Fana Specialized University Hospital, and 398 in Jugal Hospital.

Inclusion criteria

Patients with DM who are at the age of 18 years and above, and attending a diabetic follow-up clinic at public hospitals of eastern Ethiopia were included in the study.

Exclusion criteria

Severely ill patients who are unable to communicate and give required information were excluded from the study.

Study variables

The outcome variable was depression (presence/absence). The explanatory variables were socio-demographic factors like age, gender, relationship status, occupation, educational status, income, and residence; clinical variables such as co-morbidity, duration of DM, types of DM, types of medication for DM, level of blood glucose, and social and substance-related

variables like poor social support, physical inactivity, tobacco, alcohol, *Khat*, and self-care practice.

Data collection instruments

A semi-structured, pre-tested questionnaire containing five components was administered by the interviewers to collect information. Socio-demographic variables were assessed using a structured questionnaire developed by reviewing similar related articles.[36] Information related to medication was obtained from the patient and confirmed by reviewing the medical chart. Self-care activities were assessed using the standard tool developed for diabetic self-care activity. It includes dietary practice, medication adherence, physical activity, and glucose monitoring, and foot care domains. To calculate the overall diabetic self-care practice value, the average of the mean values in each of the domains was used,[37] and it was highly reliable in the study with a Cronbach's alpha of 0.82. The social support of the diabetic patient was assessed by the Oslo social support scale 3-item (OSSS-3). It is a standard tool developed to provide a brief measure of social functioning, and it is considered to be one of the best predictors of depression.[38] It was highly reliable in the study (Cronbach's alpha=0.88). Current and ever use of a substance as defined by reviewing the WHO Stepwise approach to assess non-communicable disease risk factors.[39] Patient Health Questionnaire-9 (PHQ-9) was used to assess depression. It has high sensitivity (88%) and specificity (88%) based on the structured psychiatric interview.[37] It was adopted and translated to the local language (Amharic and Afaan-Oromo) and back to English and was highly reliable in the study (Cronbach's alpha=0.86).

Sample size determination and sampling technique

The sample size for the study was estimated by a single population proportion formula with the assumption of 95% level of confidence, 5% margin of error, and 40.4% prevalence of depression from a study done in Bahirdar, Ethiopia.[36] By adding the 10% non-response rate, the final sample size became 407.

From the total of 819 diabetic patients who were on treatment at DM clinics, 407 patients were recruited for the study and proportionally allocated for both hospitals (209 and 198, for Hiwot Fana Specialized University Hospital and Jugal Hospital, respectively). A systematic random sampling technique was employed to select study participants by calculating the sampling interval (kth). Accordingly, every second patient was selected from each hospital and the first patient (out of the two) was selected by lottery method.

Data collection methods

Four trained nurses who are fluent in speaking local languages (Afaan-Oromo and Amharic languages) were selected to collect the data through face-to-face interviews and patient medical record review. One Health officer (BSc) and the principal investigator have supervised the daily activities. The training was given to data collectors and supervisors for 2 days on the data collection and ethical issues.

Operational definitions

Depression: A patient with a score of 5 and above in the PHQ-9 was considered to have depression. A total PHQ-9 score of 1–4 indicated "minimal depression," 5–9 indicated "mild depression," 10–14 indicated "moderate depression," 15–19 indicated "moderately severe depression," and 20–27 indicated "severe depression."[37]

Current use and ever of a substance: is using of at least one substance in the last 3 months and once in a lifetime, respectively.[39]

Social support is classified into three categories based on OSSS-3; "poor social support" if a sum score was 3–8, "moderate social support" if a sum score was 9–11, and "strong social support" if a sum score was 12–14.[40]

Good glycemic control: a fasting blood glucose level less than or equals 130 mg/dL.

Poor glycemic control: a fasting blood glucose level greater than 130 mg/dL.[41]

Data quality control

Quality of data were assured by beginning with 2 days of guidance for the data collectors on interviewing patients and abstracting data from patient record charts. The local language (Afan-Oromo and Amharic) versions of the questionnaire were used for data collection and checked for their reliability. The collected data from the participants was reported to the supervisor every day to enable him or her to take immediate action in case of inconsistencies or problems that happened on the reported data. The pretest of data collection tools was carried out on 5% (20 diabetic patients) of sample size in the Jenela health center and modifications were incorporated into the tools.

Statistical analysis

Data were checked for its completeness on the day it was collected. The data were entered using Epi-Data 3.1 and analyzed using SPSS 20. Findings were described using percentages and frequencies. Bivariate and multivariate logistic regression was carried out to identify factors associated with depression among diabetic patients. The presence and absence of depression (PHQ-9 $\geqslant$ 5 vs PHQ-9 < 5) was used in the logistic regression analysis. The strength of the association was described by odds ratio and 95% confidence interval (CI), and a p value less than 0.05 was considered statistically significant.

Table 1. Socio-demographic and economic characteristics of diabetic patients attending at public hospitals in Harar, East Ethiopia, 2020.

Variables		Frequency (n = 401)	Percentage (%)
Sex	Male	197	49.10
	Female	204	50.90
Age	18–29	43	10.70
	30–49	168	41.90
	50 +	190	47.40
Residency	Urban	293	73.10
	Rural	108	26.90
Marital status	Single	79	19.70
	Married	242	60.30
	Divorced	66	16.50
	Widowed	14	3.50
Educational status	No formal education	209	52.10
	Primarily school (1–8)	104	25.90
	Secondary school (9–12)	55	13.70
	Collage/university	33	8.20
Occupational status	Farmer	77	19.20
	Governmental employer	163	40.60
	Privet worker	129	32.20
	Others	32	8.00
Living circumstance	With family	316	78.9
	Alone	85	21.1
Average monthly income of the household (in USD)	Less than 25	103	25.70
	25–65	151	37.70
	66–95	69	17.20
	Greater than 95	78	19.50

Ethical consideration

Ethical clearance was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University with the approval number of IHRERC/120/2020. A formal letter of support was obtained from Haramaya University, College of Health and Medical Sciences, and submitted to Hiwot Fana Specialized University Hospital and Jugal Hospital. Before the questionnaire was administered to any eligible participant, informed voluntary written and signed consent was obtained from heads of the hospitals, and each study participant. Confidentiality was maintained at all levels of the study. Diabetic patients who were found to have severe depression were referred to psychiatry clinics for further investigations.

Results

Socio-demographic and economic descriptions of the respondents

From 407 patients selected for the study, 401 consented to the study yielding a response rate of 98%. The mean age of the participants was 48.6 years with a standard deviation of 13.2 (Table 1).

Clinical characteristics of the participants

Around 57.1% of the study participants attained the target glycemic control of <130 mg/dL (Table 2).

Self-care practice of the participants

About two-third (62.8%) of the patients had a good self-care practice. The well-attained domain-specific self-care practice was medication adherence (Figure 1).

Psychosocial and substance use behavior of participants

Based on the assessment made on the social support using the OSSS-3, about one-fourth of the patients had a poor level of social support. Concerning the substance use behavior, the median age of starting smoking was 21 years with the interquartile range of 33 years (Table 3).

Prevalence and levels of depression among diabetic patients

The overall prevalence of depression was 48.9% (95% CI: 44.2, 53.4); of whom, 80 (40.8%) had mild depression, 41 (20.92%) had moderate depression, 55 (28.1%) had

Table 2. Clinical characteristics of diabetic patients attending public hospitals in Harar, East Ethiopia, 2020.

| Variables		Frequency (n = 401)	Percentage (%)
Types of diabetes mellitus	Type I	100	24.90
	Type II	301	75.10
Glycemic control	Good	229	57.10
	Poor	172	42.90
Diabetics treatment regimen	Oral hypoglycaemic	280	69.80
	Insulin	89	22.20
	Both	32	8.00
Duration of DM (in years)	<6 years	253	63.10
	6+ years	148	36.90
Complication of DM	Yes	52	12.70
	No	349	87.30
Types of complication of DM	Ophthalmologic	28	53.80
	Hypoglycaemic	21	40.40
	Renal	3	5.80
Co-morbidity	Yes	74	18.40
	No	327	81.60
Types of Co-morbidity with DM	Hypertension	45	60.80
	Renal disease	29	39.20
Previous diagnosis of depression	Yes	13	3.2
	No	388	96.8
Family history of depression	Yes	49	12.00
	No	352	88.00
Relationship of a family member with depression	Mother	27	55.10
	Father	14	28.50
	Others	8	16.40

DM: diabetes mellitus.
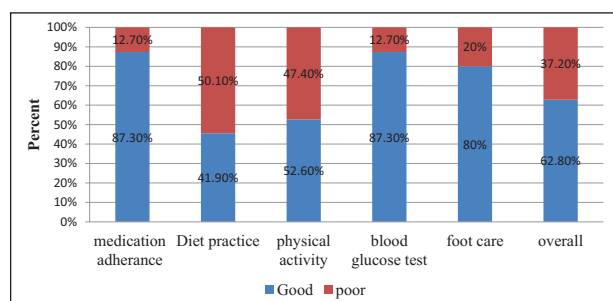
Figure 1. Domain-specific and the overall diabetic self-care activities of diabetic patients attending at public hospitals in Harar, East Ethiopia, 2020.

moderately severe depression, and 20 (10.2%) had severe depression.

Factors associated with depression among diabetic patients

Binary logistic regression was fitted to identify factors associated with depression. Accordingly, after adjusting for confounding factors having p value < 0.05 on bivariate analysis, the final multivariate analysis of depression revealed that; being female (AOR = 1.50, 95% CI: 1.39, 2.73), *Khat*

chewing (AOR = 1.88, 95% CI: 1.22, 2.93), having poor and moderate social support (AOR = 1.79, 95% CI: 1.07, 2.98 and AOR = 1.90, 95% CI: 1.14, 3.17 respectively), taking both insulin and hypoglycemic agent (AOR = 1.33, 95% CI: 1.13, 2.80), and having the illness for more than 6 years (AOR = 5.40, 95% CI: 3.42, 8.14) remained statistically significant with depression (Table 4).

Discussion

This study revealed 48.9% of diabetic outpatients have developed some level of depression. This result was similar with studies conducted in other parts of the country (Ambo general Hospital 47%,[42] Addis Ababa black lion hospital 47%,[43] and Felege Hiwot referral hospital 40%),[36] Saudi Arabia (49.6%),[44] and Pakistan (43.5%).[45]

On the contrary, the result of this study was relatively higher than a studies done in Malaysia (12.3%),[46] Bangladesh (28.3%),[47] Guinea (34.4%),[17] Uganda (34.8%),[48] and Ethiopia (17%).[49] This discrepancy might be due to the variation in socio-economic characteristics, study period, relatively poor health care delivery systems, and using different data collection instruments with varying specificity and sensitivity scale to detect the outcome variable.

Table 3. Psychosocial and substance use behavior of diabetic patients attending at public hospitals in Harar, East Ethiopia, 2020.

Variables		Frequency (n = 401)	Percentage (%)
Social support	Poor	96	23.90
	Moderate	98	24.40
	Strong	207	51.60
Payment modality to get DM service	Fee waiver	51	12.70
	Pocket	338	84.30
	Health Insurance	12	3.00
Ever smokers	Yes	116	28.90
	No	285	71.10
Current smoker	Yes	63	15.70
	No	338	84.30
Ever drink alcohol	Yes	87	21.70
	No	314	78.30
Current alcohol users	Yes	71	17.80
	No	330	82.20
Ever use Khat	Yes	231	57.60
	No	170	42.40
Current Khat users	Yes	210	52.40
	No	191	47.60
Current users of Shisha	Yes	68	17.00
	No	333	83.00
Ever use illicit drugs (cocaine, amphetamine, marijuana)	Yes	46	11.50
	No	355	88.50

DM: diabetes mellitus.

Table 4. Factors associated with depression among diabetic outpatients attending at public hospitals in Harar, East Ethiopia, 2020.

Variables		Depression		OR (95% CI)	
		Yes	No	COR (95% CI)	AOR (95% CI)
Sex	Female	108	96	1.39 (1.94, 2.06)	1.50 (1.39, 2.73)*
	Male	88	109	1	1
DM complication	Yes	31	20	1.74 (1.95, 3.17)	1.78 (0.83, 3.83)
	No	165	185	1	1
Treatment regime	Oral	140	140	1	1
	Insulin	46	43	1.07 (0.66, 0.87)	1.08 (0.64, 1.83)
	Both	10	22	0.46 (0.21, 0.99)	1.33 (1.13, 2.80)*
Duration of the illness	<6 years	137	136	1	1
	6+ years	59	89	1.78 (1.18, 2.67)	5.40 (3.42, 8.14)*
Presence of co-morbidity	Yes	46	27	2.02 (1.20, 3.41)	1.52 (0.4, 3.14)
	No	150	178	1	1
Currently using Khat	Yes	122	88	2.19 (1.47, 3.27)	1.88 (1.22, 2.93)*
	No	74	117	1	1
Social support	Poor	55	41	1.85 (1.13, 3.02)	1.79 (1.07, 2.98)*
	Moderate	54	44	1.69 (1.04, 2.75)	1.90 (1.14, 3.17)*
	Strong	87	120	1	1

OR: odds ratio; CI: confidence interval; COR: crude odds ratio; AOR: adjusted odds ratio; DM: diabetes mellitus.
Note: *Significant association at p value < 0.05.

But, the finding of this study was lower than other similar studies in Iran (61%),[50] Cameroon (60%),[51] and Tanzania (87%).[45] The likely explanation for this discrepancy might be the variation in sampling size, design (prospective study in Iran), outcome assessment tools (CESD in Cameron), and description of the participants.

Female diabetic outpatients were 1.5 times more likely to develop depression than male diabetic outpatients. This result

was consistent with a similar study conducted in Ambo general hospital, Ethiopia.[42] This might be due to cultural discrimination, sexual harassment at the workplace, the sentimental nature of female's responses to traumatic events, hormonal differences, and managing personal relationships while simultaneously attempting to manage their disease.[52–54]

In this study, the duration of the illness was also significantly associated with depression. Having diabetes persisting for a long duration increased 5.4 times the odds of having depression. In the same manner, the long duration of the illness has been recognized as an important predictor for depression in studies done in Ambo[42] and Gondar, Ethiopia.[41] The previous study has proven that an increased risk of having complications and health care expenditures with increased duration of DM may prone diabetic patients to develop psychological illnesses.[55]

Another important predictor of depression among diabetic patients was the treatment regime; individuals who took both insulin and oral hypoglycemic agent were more likely to develop depression than individuals who took only insulin or oral hypoglycemic agent. This result is in line with the study conducted in Bahirdar, Ethiopia.[36] Depression creates barriers to the management of diabetes, and the presence of behavioral disturbance might be associated with difficulties adhering to the complex self-management of diabetes, both injection and orally, as a result, it creates fear to take two medications at a time.[56,57]

Depression was also significantly associated with social support. This finding is similar to studies done in Saudi Arabia[58] and Addis Ababa, Ethiopia.[59] Even though the exact mechanism by which social support affects patient adherence is not yet completely understood, social support from family provides patients with practical help and can buffer the stresses of living with illness. This is because poor social support negatively affects self-care and treatment adherence.[60,61]

In this study, using a *Khat* was significantly associated with depression. Patients who were chewing a *Khat* were about 1.9 times more likely to have depression than their counterparts. This result is in agreement with the finding from studies conducted in Muhimbili National Hospital, Tanzania[62] and Jimma, Southwest Ethiopia.[63] This finding could result from the fact that the amphetamine-like psychoactive chemicals found in the *khat* stimulate the release of monoamine neurotransmitters like dopamine in the limbic area, resulting in reward sensations consequently to depression.[64] Also, it might be due to the fact that patients with depression using a Khat as self-medication which helps in reducing their depressive symptoms.[42]

Such a high occurrence of depression has a variety of implications. In the first place, this entity has a profound impact on the quality of life of the patients with chronic diseases, independent of the possibility of being treated. When depression is recognized in a timely manner, it is possible to decrease the intensity of symptoms as well as to prevent new episodes. Diabetes is associated with higher rates of lost work time, disability, and premature mortality. Diabetes and its complications bring about substantial economic loss to people with diabetes and their families and to health systems and national economies through direct medical costs and loss of work and wages.

Limitation of the study

This study has some important limitations that should be kept in mind when interpreting the results. Due to a lack of sophisticated screening tests, diabetes complications addressed in this study were only confirmed by the patient's subjective response and their chart review. The cross-sectional nature of the study design does not confirm a definitive cause-and-effect relationship. Some variables like duration of illness rely on the patient's history that might have recalled bias.

Conclusion

This study revealed a relatively high prevalence of depression in diabetic outpatients. A lesser level of social support, taking oral and insulin treatment regimes, longer duration of illness, using *Khat*, and being female were significantly associated with depression among diabetic outpatients. Based on the findings, diabetic clinics should develop guidelines to detect and manage depression among diabetic patients. Clinicians need to give emphasis to diabetic patients with long duration of the illness and low level of social support. Heath educators should provide continuous health information and education toward raising awareness about substances and early signs and symptoms of depression to be delivered for patients to promoting early detection.

Ethics approval

Funding

Informed consent

Written informed consent was obtained from all subjects before the study.

ORCID iDs

Dawit Tamiru [iD] https://orcid.org/0000-0002-0201-8138

Behailu Hawulte [iD] https://orcid.org/0000-0001-6023-7542

Tadesse Misgana [iD] https://orcid.org/0000-0002-5022-1915

Supplemental material

Supplemental material for this article is available online.

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