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Prevalence of Depression in Diabetes Mellitus Patients with Associated Co-Morbidities in Addis Ababa, Ethiopia, 2022

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Abstract

Background: Diabetes and depression are extremely common, devastating, and incapacitating diseases. Co-existing Depression in people with diabetes results in decreased adherence, poor health outcomes, higher diabetes complications, decreased quality of life, increased disability, and lost productivity with an increased risk of death. The aim of the study was to assess the prevalence of depression in Diabetes Mellitus patients with associated co-morbidities in Addis Ababa, Ethiopia, 2022.

Methods: An institutional-based cross-sectional study design was conducted among 403 diabetes patients in the armed force general hospital, Addis Ababa, Ethiopia, from April to Jun 11, 2022. The participants were selected using systematic random sampling. Data was collected by face-to-face interview using a standardized and pretested questionnaire. Depression was assessed using the patient health questionnaire. Data was entered into EPI INFO and analyzed by SPSS version 25 software. Logistic regression analyses were performed to identify factors associated with depression, and a significant association was declared at a p-value less than 0.05 and a 95% confidence interval.

Result: The study showed that the overall prevalence of depression was found to be 37.2% and respondents who had moderate social support (AOR = 2.429, 95% CI: 1.208–4.881), age 35 (AOR = 0.358, 95% CI: 0.181–0.706), age 45–54 (AOR = 0.431, 95% CI: 0.232–0.801), insulin users (AOR = 0.471, 95% CI: 0.227-0.976), metformin users (AOR = 0.104, 95% CI: 0.105-0.397), liver disease (AOR = 3.077, 95%CI: 2.437–7.265), and could read and write (AOR = 8.253, 95% CI: 3.278–24.527) were significantly associated with depression.

Conclusion: This study demonstrated that the prevalence of depression among diabetes patients at Armed Forces General Hospital was found to be high. Furthermore, depression was associated with social support, age, anti-diabetic drug users, liver disease, and educational level. Different stakeholders, including hospital managers, health professionals, and different non-governmental organizations, should give emphasis to linking depressive patients with hospitalization.

Keywords: Diabetes Mellitus; Depression; Associated Factors; Addis Ababa; Ethiopia

Abbreviations: ADA: American Diabetes Association; AFGH: Armed Force General Hospital; ART: Anti-Retroviral Therapy; CDC: Center For Control and Prevention Of Disease; CVD: Cardiovascular Disease; DM: Diabetes Mellitus; DSM: Diagnostic and Statistical Manual; ENT: Ear, Nose, Throat; IDF: International Diabetes Federation; MADRS:

Montgomery Asburg Depression Rating Scale; MDD: Major Depressive Disorder; MDR: Mycobacterium Drug Resistance; NCS: National Comorbidity Survey; NESARC: National Epidemiology Survey of Alcoholism and Related Conditions, PHQ: Patient Health Questionnaires; T1DM: Type One Diabetes Mellitus; T2DM: Type Two Diabetes Mellitus, WHO: World Health Organization.

Introduction

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. Mental health includes subjective well-being, perceived self-efficacy, autonomy, competence, intergenerational dependence, and recognition of the ability to realize one's intellectual and emotional potential. Mental disorders such as depression, anxiety and substance abuse are common in chronic disorders, which can lead to poor health outcomes and failure to adhere to treatment plans [1].

Diabetes mellitus is a group of metabolic diseases characterized by increased levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both (American Diabetes Association [ADA]). Normally, a certain amount of glucose circulates in the blood [2].

Depression is used to describe a range of moods – from low spirits to a severe problem that interferes with everyday life. The experience of depression is an overwhelming feeling which can make you feel quite unable to cope and hopeless about the future [3]. Depression can be very different in different people, or in the same person over time. It is a common but serious illnesses and treatment can help those with even the most severe depression get better [4].

Depression might have a severe impact on the course and prognosis of diabetes and should therefore be carefully diagnosed and treated early in the course of illness [5]. Diabetes and depression have a bidirectional relationship, i.e., diabetic patients are more likely to develop depressive disorders, while the normo-glycemic population has increased risk of acquiring a diabetic condition during their life time [6-9].

Depression is a significant contributor to the global burden of disease and affects people in all communities across the world. Today, depression is estimated to affect 350 million people. The World Mental Health Survey, which was conducted in 17 countries, discovered that, on average about 1 in 20 people report having an episode of depression each year. While depression is the leading cause of disability for both males and females, the burden of depression is 50% higher for females than males. In fact, depression is the leading cause of disease burden for women in both high-income and low- and middle-income countries [10].

The coexistence of diabetes and mental disorders has a strong impact on the patient, with an increased risk of cardiovascular disease (CVD), all causes of mortality, especially as a result of cardiovascular complications of DM [11]. Diabetes mellitus is the third leading cause of death by disease, primarily because of the high prevalence of cardiovascular disease (myocardial infarction, stroke, and peripheral vascular disease). It affects about 17 million people, 5.9 million of whom are undiagnosed [12]. The overall prevalence of depression among diabetes patients at the diabetes clinic was reported to be 87% and most 56.7% had mild depression 22.1% had moderate depression, and 8.2% had severe depression [13].

Studies suggested that the prevalence of depression in Low and Middle-Income Countries and Sub-Saharan African countries was comparable with High-Income countries at around 10–20% of the population. However, the majority of people suffering from depression go untreated [14]. Despite research carried out in primary healthcare settings indicating a high prevalence of depression among facility attendees, particularly in the context of co-morbid chronic diseases, evidences were not sufficient at developing countries including Ethiopia specifically at armed force hospitals hence most of clients are militaries, those military personals have a stressful and risky life situation; including potential injury or death, witnessing the loss of human life, temporary campaign away from home, mission, frequent changes of home from place to place and exposure to dangerous equipment and materials which can potentially increase the risk of depression [14]. Therefore, the aim of this study was to assess the prevalence of depression and associated factors among diabetes mellitus patients at the armed force hospital in Addis Ababa, Ethiopia, 2021.

Methods

Study Area

The study was conducted at the armed forces hospital in Addis Ababa, Ethiopia. It was formerly known as Princess Tsehai Memorial Hospital, the hospital has 10 departments and 1100 clinical and supportive staff. Of those, 306 were military and the remaining were civil servants. The hospital has 460 beds and provides service to an annual average of 140,000 patients. There were around 520 diabetes mellitus patients with follow up at the chronic illness follow up clinic. It had psychiatry, surgical, medical, orthopedics, MDR, obstetrics, gynecology, and pediatric wards. There was also antenatal care, anti-retroviral therapy (ART) service, Operation Room (OR), Ear, Nose, and Throat (ENT),

Dermatology, ophthalmology, dental, and emergency services. The study was conducted using an ethical clearance letter obtained from Yanet College. Full permission and acceptance letters were obtained from the armed forces hospital administration.

Design and Duration of the Study

An institution-based cross-sectional study was conducted from April to June 2022.

Study Population

Sampled patients with diabetes mellitus, who had follow-up at Armed Force Hospital chronic illness follow-up clinic during the study period.

Eligibility Criteria

- **Inclusion Criteria**
  Patients who were diagnosed with diabetes and had a follow-up age of more than 18 years.
- **Exclusion Criteria**
  Patients who were diagnosed with diabetes and had a serious illness and unable to communicate were excluded from the study.

Sample Size Determination

The sample size was estimated using a single population proportion formula. Considering 95% CI, 5% margin of error, and proportion of depression among diabetic patients 50% hence there were no previous studies in a similar setting.

Then we added a non-response rate of 5%, and it was finally 403.

The Technique and Procedure of Sampling

The lists of potential respondents were obtained from the updated registry book at the follow-up clinics of the armed force general hospital. Then, the study participants were selected by using a systematic random sampling technique in order of their appointments. The total number of diabetes mellitus patients who were on follow-up was 520 patients. So, the first patient was selected between the first and K^{th} interval, then we determined K value.

K=N/n, where N is the total number of diabetes mellitus patients. Then K was 520/403 = 1.29, then the study participants were selected from the 1^{st} interval up to the maximum sample size that had been achieved from each diabetes mellitus patient who presented for follow up at the armed force general hospital's chronic illness follow-up clinics.

Study Variables

- **Dependent Variable**
  Depression (presence or absence)
- **Independent Variables**
  Socio-demographic variables like age, sex, education status, monthly income, religion, occupation status, residence and marital status.
- **Behavioral And Lifestyle Characteristics**: alcohol consumption, cigarette smoking and chewing chats.
- **Medical Related Characteristics:** heart disease. blood pressure, lung disease, liver disease, Blood sugar level, and DM complications.
- **Medication-Related Characteristics:** insulin users and users of oral anti-diabetic medications.
- **Social Characteristics**: social support, stigma, duration of DM, and hospital admission.
- **Physical Characteristics** include limb loss, immobility, and mobility.

Data Collection Tools and Procedures

The data was gathered using a standardized questionnaire designed to assess depression in diabetic patients. This tool was not developed for clinical diagnosis. It is repeatable, sensitive and useful as a screening and surveillance tool for depression disorders, including diabetes patients (15). The questionnaire was used to assess prevalence and associated factors like socio-demographic characteristics, lifestyle and psychological factors to determine the depression of individuals with diabetes. The data was collected by a face-to-face interview using an Amharic language translated questionnaire.

Operational Definitions

Depression is a common mental disorder characterized by depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration. Moreover, depression often comes with symptoms of anxiety [10]. The PHQ-9 scoring system was used to assess depression in patients with established. The PHQ-9 subscale is classified as:

- **There is no depression:** less than 0 [15].
- **Minimal depression:** Study participants who had a score of 1-4 from PHQ 9 total score [15].
- **Mild depression**: diabetes patients with a PHQ 9 total score of 5-9 [15].
- **Moderate depression:** diabetes patients with a PHQ-9 total score of 10-14 [15].
- **Moderately severe depression:** a diabetic patient with a total score of 15-19 on the PHQ-9 [15].

- **Severe depression:** a DM patients who had score 20-27 from PHQ 9 total score [15].

Diabetes mellitus is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both [16].

Major Depressive Disorder (MDD) is characterized by discrete episodes of at least 2 weeks' duration (although most episodes last considerably longer) involving clear-cut changes in affect, cognition, and neurovegetative functions and inter-episode remissions [17].

The (Oslo scale social support 3 item) OSSS-3 sum score can be operationalized into three broad categories of social support [18]

Poor social support: 3-8

Moderate social support: 9-11

Strong social support: 12-14

Stigma is defined as "a mark of shame, disgrace, or disapproval which results in an individual being rejected, discriminated against, and excluded from participating in a number of different areas of society [19].

Quality Assurance of Data

The quality of data was assured before, during, and after the data collection. Before data collection, the questioners were pretested on 5% of the target population to evaluate the reliability and validity of the study prior to the final distribution and then after the data collection. The questionnaire was prepared first in English and then translated into Amharic, finally retranslated back to English to check for consistency. Two days of training were given for data collectors based on prepared training manuals, and how to use field guiding, procedure of data collection, and review of key terminologies, and ethical issues of the study were discussed in detail by the principal investigator prior to the actual data collection period.

During the data collection period, the collected data was checked for completeness and for its consistencies by the principal investigators and supervisors every night of data collection. For the duration of their appointment, patients were seen once a month. After the data collection, the collected datasets were rechecked for their completeness and consistency by the supervisors and principal investigators.

Data Processing and Analysis

After checking the collected data visually for completeness, the response was coded and entered into the computer using EPI Info version 7.1 Statistical Packages. Then printed frequencies were used for outlier checking and for cleaning data. The data was cleaned accordingly and then exported to SPSS version 25 for further analysis. The frequency distributions of dependent and independent variables were workout and presented in tables and figures. The associated factors were identified using bivariate and multivariate logistic regression analysis.

Results

Socio-Demographic Characteristics of the Study Participants

Variable	Category	Frequency (n=403)	Percent (%)
Sex	Male	291	72.2
	Female	112	27.8
Age in year	18-34	43	10.7
	35-44	96	23.8
	45-54	102	25.3
	>=55	162	40.2
Religion	Muslim	65	16.1
	Orthodox	218	54.1
	Protestant	113	28
	Catholic	6	1.5
	Jubbah	1	0.2
Marital status	Married	269	66.7
	Single	80	19.9
	Divorced	30	7.4
	Widowed	16	4
	Separated	8	2
Educational status	Can read and write (Informal education)	12	3
	1-8 grade	44	10.9
	9-12 grade	161	40
	Diploma and above	186	46.2
Occupation	Active military	231	57.3
	Medical bored	52	12.9
	Pension	120	29.8
Residence	Urban	290	72
	Rural	113	28
Monthly Income (ETB)	<1500	1	0.2
	1500-3000	113	28
	3001-4500	129	32
	4501-6000	96	23.8
	>6001	64	15.9

Table 1: Socio-demographic characteristics of Armed Forces General Hospital Addis Ababa, Ethiopia 2022 study participants (n=403).

A total of 403 participants took part with a response rate of 100%. About 291 (72.2%) of the participants were males, and a higher percentage 218 (54.1%) of the participants were orthodox in religion. 269 (66.7%) of the respondents were married, and 186 (46.2%) of the participants had completed their diploma and above. Concerning their occupation, 231 (57.3%) of the participants were active military. Of the total respondents, 162 (40.2%) were over the age of 55. The largest proportion129 (32.0%) of the respondents had an income of 3001-4500 Ethiopian Birr (ETB) per month and 290 (72.0%) of respondents lived in urban areas (Table 1).

Social, Behavioral, and Lifestyle Characteristics of Respondents

Of the total respondents, 224 (55.6%) had moderate social support and nearly two-thirds (61.3%) of the interviewers had less than eight years of diabetes mellitus duration. Of the total respondents (178, 44.2%) had a history of hospital admitting and 48 (11.9%) were drank alcoholic beverages. Around 30 (7.4%) respondents were smoking cigarettes and 35 (8.7%) were chewing chat (Table 2).

Variable	Category	Frequency (n=403)	Percent (%)
Social support	Poor	96	23.8
	Moderate	224	55.6
	Strong	83	20.6
Duration of diabetic mellitus(in year)	<8	247	61.3
	Sep-16	114	28.3
	>17	42	10.4
Hospital admission	Yes	178	44.2
	No	225	55.8
Do you drink alcoholic beverage?	Yes	48	11.9
	No	355	88.1
Dou you smoke cigar ate?	Yes	30	7.4
	No	373	92.6
Do you chew chat?	Yes	35	8.7
	No	368	91.3

Table 2: Social, behavioral, and lifestyle characteristics of study participants at the Armed Forces General Hospital in Addis Ababa, Ethiopia 2022 (n = 403).

Medical and Medication Characteristics of Respondents

The majority of study participants 264 (65.5%) fasting blood glucose levels was normoglycemic (euglycemic) and 73 (18.1%) developed diabetes mellitus complications. Over half of the study participants (227, 56.3%) were taking metformin oral anti-diabetic medication and 15 (3.7%), 91 (22.6%), 39 (9.7%) 16 (4.0%), and 12 (3.0%) of participants had heart disease, HTN, lung disease, kidney disease, and liver disease (Table 3).

Variables	Category	Frequency (n=403)	Percentage (%)
Heart disease or problems?	Yes	15	3.7
	No	388	96.3
High blood pressure or Hypertension?	Yes	91	22.6
	No	312	77.4
Lung disease or problems (such as Asthma, TB, Pneumonia or others	Yes	39	9.7
	No	364	90.3
Kidney disease?	Yes	16	4
	No	387	96
Liver disease?	Yes	12	3
	No	391	97

Fasting blood sugar level?	Normoglycemic	264	65.5
	Hyperglycemic	117	29
	Hypoglycemic	22	5.5
Diabetics' mellitus complication?	Yes	73	18.1
	No	330	81.9
Types of drug taking currently?	Insulin	92	22.8
	Metformin	227	56.3
	Metformin and glimepiride	84	20.8

Table 3: Medical and medication-related characteristics of the study participants at Armed Forces General Hospital, Addis Ababa, Ethiopia, 2022 (n = 403).

Characteristics that are Physically Related

The majority of study participants, 362 (89.8%), were physically mobile, while 24 (6.0%) were unable to move their extremities (Table 4).

Variables	Category	Frequency(n=403)	Percent (%)
Loss of extremities	Yes	24	6
	No	379	94
mobility	Yes	362	89.8
	No	41	10.2

Table 4: Physical characteristics of study participants (n = 403) at Armed Forces General Hospital in Addis Ababa, Ethiopia, in 2022.

Depression-Related Characteristics

Of the total respondents, 64 (15.9%) were mild depressed, 61 (15.1%) moderate depressed, 17 (4.2%) of the respondents were severely depressed, 8 (2.0%) minimal depression, and there was no severe depression. In this study, the PHQ-9 measurement tool yielded a total score of 253, indicating that there was no depression (62.8%) (Figure 1).

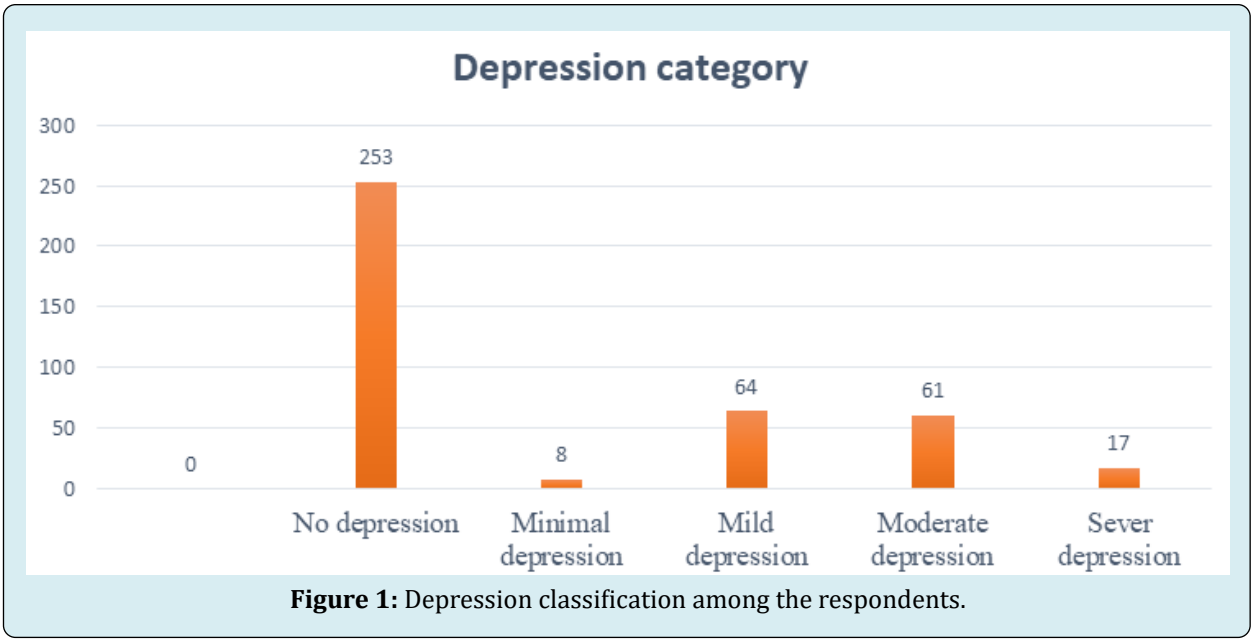

Figure 1: Depression classification among the respondents.

Bivariate Analysis of Factors Associated with Depression among Patients with Diabetes Mellitus

Those variables performed in the bivariate analysis with p-values less than 0.25 were candidate for multivariate analysis. To identify independent predictors for depression among the participants of 403, from the variables social support, Age, diabetes medication users, liver disease, physical mobility and educational status were associated with depression (Table 5).

Variable	Depression	No depression	COR (95%CI)	P-value
Social support category				
Poor social support	39(40.6)	57(59.4)	1.897(1.005-3.581)	0.048
Moderate social support	89(39.7)	135(60.3)	1.828(1.048-3.188)	0.033
Strong social support	22(26.5)	61(73.5)	1	
Current age category				
Age 18-34	3(7.0)	40(93.0)	0.049(0.015-0.165)	0
Age 35-44	20(20.8)	76(79.2)	0.172(0.096-0.308)	0
Age 45-54	29(28.4)	73(71.6)	0.259(0.152-0.442)	0
Age>55	98(60.5)	64(39.5)	1	
Diabetic treatment regime				
Insulin user	39(42.4)	53(57.6)	0.294,(0.157-0.552)	0
Metformin user	51(22.5)	176(77.5)	0.116,(0.066-0.204)	0
Metformin & glimepiride user	60(71.4)	24(28.6)	1	
Physical mobility				
Yes	116(32.0)	246(68.0)	0.097 (0.042-0.226)	0
No	34(82.9)	7(17.1)	1	
Liver disease				
Yes	10(83.3)	2(16.7)	8.964 (1.937-4.490)	0.005
No	140(35.8)	251(64.2)	1	
Current educational status category				
Can read and write (informal education)	11(91.7)	1(8.3)	21.476 (2.711-17.112)	0.004
1-8 grad	17(38.6)	27(61.4)	1.229 (0.624-2.423)	
9-12 grad	59(36.6)	102(63.4)	1.129(0.726-1.756)	0.551
Diploma and above	63(33.9)	123(66.1)	1	0.589

Table 5: Bivariate analysis of study participants at Armed Forces General Hospital, Addis Ababa, Ethiopia, 2021 (n = 403).

Multivariate Analysis Results for Factors Associated with Depression among Patients with Diabetes Mellitus

Multivariate analysis was performed to identify independent predictors for depression among the participants. In multivariate analysis, variables with p 0.05 were declared significantly associated with depression. Consequently, respondents who had social support, age, diabetes medication users, liver disease, and educational status were determined.

Those patients with moderate social support were 2.43 times more likely to have depression than those who had strong social support (AOR = 2.429, 95% CI: (1.208-4.881). Those patients who were insulin users were 53% less likely to have depression compared to those patients on metformin and glimepiride (AOR = 0.471, 95% CI: 0.227-0.976).

Those patients who were liver diseased were 3 times more likely to be depressed than those patients who had no liver disease (AOR = 3.077, 95% CI: 2.437–7.165). Those patients who could read and write were 8.25 times more

likely to be depressed compared to those patients who had a diploma and above (AOR = 8.253, 95% CI: 3.278–24.527) (Table 6).

Variable	Depression	No depression	AOR (95%CI)	p-value
Social support category				
Poor social support	39(40.6)	57(59.4)	1.975(0.876-4.454)	0.101
Moderate social support	89(39.7)	135(60.3)	2.429(1.208-4.881)	0.013
Strong social support	22(26.5)	61(73.5)	1	
Current age category				
Age 18-34	3(7.0)	40(93.0)	0.106(0.029-0.383)	0.001
Age 35-44	20(20.8)	76(79.2)	0.358(0.181-0.706)	0.003
Age 45-54	29(28.4)	73(71.6)	0.431(0.232-0.801)	0.008
Age>=55	98(60.5)	64(39.5)	1	
Diabetic treatment regime				
Insulin user	39(42.4)	53(57.6)	0.471(0.227-0.976)	0.043
Metformin user	51(22.5)	176(77.5)	0.204(0.105-0.397)	0
Metformin and glimepiride user	60(71.4)	24(28.6)	1	
Physical mobility				
Yes	116(32.0)	246(68.0)		
no	34(82.9)	7(17.1)	0.223(0.088-0.563)	0.001
			1	
Liver disease				
Yes	10(83.3)	2(16.7)		
no	140(35.8)	251(64.2)	3.077(2.437-7.165	0.003
Current educational status category				
Can read and write	11(91.7)	1(8.3)	8.253(3.278-24.527)	0.002
1-8 grad	17(38.6)	27(61.4)	1.679(0.686-4.113)	0.257
9-12 grade	59(36.6)	102(63.4)	1.082(0.633-1.850)	0.774
Diploma and above	63(33.9)	123(66.1)	1	

Table 6: Multivariate analysis of the study participants at Armed Force General Hospital, Addis Ababa, Ethiopia, 2022 (n = 403)

Discussion

This study showed that the overall prevalence of depression was found to be (37.2%), moreover social support, age, educational level, liver disease and anti-diabetes drug users were significantly associated with depression The finding of the current study was in line with a cross-sectional study done in Mizan Tepi University Hospital(37%) [20].

However the present study was lower than a cross-sectional study conducted in Palestine primary health care center(40%) [8] in Egypt suz canal hospital (69.0%) [21], in Ethiopia metanalysis research overall prevalence(39.73%) (22), in Bahirdar Felege Hiwot specialized hospital 40.40% [23] and Jimma University specialized hospital 43.6% [5].

The discrepancy might be due to different assessment tools, health service delivery systems, educational status, lifestyle, and social interaction. For example in Egypt, the MADRS screening tool was used for assessing depression. In the study of Ethiopia (Felege-Hiwot Referral hospital and Jimma University Specialized Hospital), Beck depression inventory (BDI II) was used to assess depression. The other reason for the difference might be due to difference with study settings and participants. For example, the study in Egypt was done among individuals with Type 2 DM [24].

On the other hand, the result of this study was relatively higher than studies conducted in Spain Madrid 20.03% [11]. Victoria hospital 19.9% [7], Nepal (27%) [25], University of

Gondar diabetic clinic 15.4 %[26], Black-Lion Specialized Hospital 13% [12], Meekly hider hospital(17%) [27], and Tirunesh Beijing general hospital Addis Ababa, Ethiopia (21.3%) [24].

One of the reasons for the difference might be the difference with health care settings and likely due to the cut-off score for PHQ-9 being 5. Besides, it could be due to variation in attributes of study participants, use of different psycho metric scale, study design, time frame and sample size. The second objective of this study was to identify the associated factors of depression among patients with diabetes mellitus. Accordingly, the odds of developing depression among diabetic patients who have moderate social support were two times more likely when compared to clients who have strong social support. This finding was similar to the study conducted in Bahirdar Ethiopia at Felege-Hiwot referral hospital [28] and Tirunesh Beijing general hospital [24].

This might be due to the fact that social isolation reduces social support, which can have undesirable influence on physical and mental wellbeing. Having moderate social support may leads to delayed diabetic treatment. If the treatment is delayed, the patient will have an early sign of diabetic-related complication which predispose the patient to different psychiatric disorders including depression. The odds of educational status with respondents who can read and write were 8.25 times more likely to have depression compared to those who were diploma and above, similar study conducted in Palestine [8], Saudi Arabia [29] and Seri lanka [30] , this might be due to the difference in sample size, economic status and study setting.

The odds of anti-diabetes drug users' respondents who were insulin users were 53% less likely to have depression compared to that of metformin users and glimipride, similar results were found with study conducted in Nepal [25], Bangladesh [31] and East Shewa Adama, Ethiopia [31], this might be due to the fact that respondents who were insulin users might have better social support and income.

In contrast to some other studies, this study showed no significant association between depression score with gender and marital status [30] this study showed no significant association between depression and participants monthly income which is contrary to other published studies [29], this study found that the duration of DM and residence was not significantly associated with depression which is consistent with the findings reported by other studies [20].

Finally, this study was not free of limitations due to lack of sophisticated screening tests, time and budget constraints, diabetes complications were not addressed in this and were not confirmed by respective specialists instead only by patient's subjective response of complication was detected. As the study was a simple cross sectional study design, it was impossible to know the direction of cause-and-effect relationship of diabetic and depression. Data were collected by self-report rather than observation which could lead to recall and social desirability bias.

Conclusion

This study revealed a high prevalence of depression among diabetes patients in Addis Ababa, Ethiopia. Furthermore, depression had associated with social support, anti-diabetes drug users, liver disease, and educational level.

Recommendation

The finding of this study revealed that a significant number of diabetes patients had a high level of depression. These findings request for the need of integrated interventional management on diabetes mellitus and depression, which will increase health and wellbeing of the patients. Therefore, in order to reduce risk of depression among diabetes patients different stakeholders including Hospital managers, diabetic association, health professionals, health programmers, and different non-governmental organizations should give emphasis on linking depressive patients, to different supporting social groups, improving knowledge through health education on diabetes and depression.

Declaration

- **Ethical consideration**

Ethical approval was obtained from Yanet College of research and ethical board. Permission letter was obtained from armed force hospitals. An informed written consent was obtained from each study participants. All respondents were informed that the participation was voluntarily. The potential benefits, harms, confidentiality, and the possibility of withdrawing from the interview at any time of interview and after were also informed.

- **Consent for Publication**

Not applicable

- **Data Availability**

The data used to support the findings of this study are available from the corresponding author upon request.

- **Conflicts of Interest**

The author declares they have no competing conflicts of interest.

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