The Open Public Health Journal

Content list available at: https://openpublichealthjournal.com

RESEARCH ARTICLE

The Magnitude of Suicidal Behavior among People Living with Diabetes Mellitus Attending an Outpatient Department of Alamata General Hospital, Mekelle, Tigray, Ethiopia 2019: A Cross-Sectional Study

Abreha Tsegay Gebreselassie[1,*], Workua Mokenen Metekiya[1] and Birhane Gebrehiwot[1]

[1]*Department of Psychiatry, College of Health Sciences, Mekelle University, Tigray, Ethiopia*

Abstract:

Background:

Globally, suicide accounts for 75% in low and middle-income countries (LMICs). Though the magnitude of suicidal behavior in High-income Countries (HIC) is higher relative to the general population, limited studies had explored suicidal behavior among medical outpatients in LMICs including this locality. Suicidal behaviors among people with the chronic medical illness are one of the commonest psychiatric emergencies that demand a major health concern by researchers and mental health task forces. People with chronic medical illnesses show suicidal ideation and attempt which are fatal problems to end life. Therefore, this study will address the gaps by determining the magnitude of suicidal behavior among Diabetes Mellitus (DM) patients in an outpatient setting of Alamata General Hospital (AGH).

Methods:

Institutional based cross-sectional study was conducted among medical patients attending a chronic care clinic in Alamata general Hospital from May to June 2019. A sample of 146 DM patients who were attending an outpatient chronic care clinic was included in the study. Suicidal behavior was assessed by the World Health Organization (WHO) suicidal behavior assessment through software called Statistical Package for Social Science (SPSS) Version 25.

Results:

The magnitude of suicidal behavior among Diabetes Mellitus patients at AGH was 30.8%, 15.8% had suicidal ideation, 14.4% had a suicidal attempt and 15.1% of them had the plan to commit suicide.

Conclusion:

The prevalence of suicidal behavior was found to be significantly high in Diabetes Mellitus patients. Hence, it is important to conduct more interventions to assess the suicidal behavior symptoms among Diabetes Mellitus patients.

Keywords: Suicidal behavior, Diabetes Mellitus, Hospital, Magnitude, Ethiopia, High-income countries.

Article History	Received: May 01, 2020	Revised: August 16, 2020	Accepted: August 16, 2020

1. INTRODUCTION

Suicide is a fatal act of terminating one's own life and it is a complex process that involves a series of pathways and mechanisms from initiation of ideation, to planning, and finally to attempting suicide [1]. Some plan for days, weeks, or even years before the suicide attempt, while others take their lives without premeditation [2]. Suicidal ideation is an important phase in the suicidal process. Preceding attempted suicide is the major risk factor for completed suicide [2, 3]. It is known that suicidal ideas and suicide attempts occur more frequently in patients with DM than in the general population [4].

Diabetes Mellitus (DM) is a chronic disease that has become a serious public health problem worldwide [5]. Diabetes mellitus is a metabolic disorder of multiple etiological factors characterized by chronic hyperglycemia with disturbance of carbohydrate, fat, and protein metabolism which resulted from either insufficient Insulin secretion, resistance to the action of Insulin, or both [6]. It is a chronic disease that has become a serious public health problem worldwide [5, 7, 8].

* Address correspondence to this author at Department of Psychiatry, College of Health Sciences, Mekelle University, Tigray, Ethiopia;
E-mail: abrehatsegay@gmail.com

Several studies support that DM has profound effects on physical and emotional health. Furthermore, DM has been associated with many adverse health effects including reduced life expectancy, increased risk of various complications, decreased quality of life, and even death [5, 7, 9, 10]. On the other hand, it has been reported that patients with chronic medical conditions such as type 2 diabetes mellitus (T2DM) are more likely to manifest psychiatric traits when compared with healthy individuals [11 - 14]. To date, the cause and effect relationship between these entities is not clear; we do not know whether diabetes increases the risk of psychiatric traits as depression, or whether psychiatric traits increase the risk of diabetes [15 - 17]. Nonetheless, differences have been reported between patients with type 1 or type II diabetes. For instance, a recent study of people who died by suicide in Finland reported that the proportion of patients with type II diabetes who completed suicide was twice the proportion of patients with type 1 diabetes who completed suicide [18]. The risk factors of suicidal behavior such as depression, anxiety, or hopelessness are present in patients with type 2 diabetes [13, 19]. Suicide is an important public health issue; which is the 10th leading cause of death worldwide, a second leading cause of death among those aged 15-29 [20]. An estimated number of more than 804,000 suicide bases occurred worldwide in 2012 and represent 1.8% of the global burden of disease [21]. It is estimated to contribute more than 2.4% of the global burden of disease by the year 2020 and the rate of death due to suicide will be increased to one every 20 seconds [3].

1.1. The Magnitude of Suicidal Ideation and Attempt

Suicidal ideation and attempt among people with DM had been reported as high as 58.5% [22] and 13.3% [23], respectively in the USA. Similarly, suicidal ideation was 51.4% in South Korea [24], and 20%, in Australia [17]. Suicidal behaviors in DM are higher in those with low-level education, female gender in Ethiopia [25], and alcohol use and cigarette smoking in the USA [26].

In Ethiopia, the magnitude of suicidal ideation and attempt among patients with severe mental illness is reported to be 23.3% for major depression, 23.8% for bipolar disorder, and 13.1% for schizophrenia [27]. Whereas another study reported in Ethiopia, Bahirdar that the lifetime prevalence of suicidal plan was 10.7%, and an attempt was found to be 7.6% [25].

The magnitude of suicidal behavior in patients with type 2 diabetes in Mexico was 11.6% [28] and diabetes increased the risk of death by suicide [14, 29]. The magnitude of previous suicide attempts in diabetic patients in Mexico was 11.4% [28]. It was found that suicide attempters with T2DM showed higher levels of blood glucose than those without a history of suicide. Old age can be a protective factor for suicidal behavior, as suicidal behavior magnitude decreases with age [30, 31] and younger individuals have more responsibilities and are under more stress than older individuals [28].

Deaths from hanging have increased from 16-24%. Most of the suicide deaths were reported in males of the 20 to 30 years age group. Deaths due to poisoning have increased from 4% to 28% over the past 8 years, with males predominating over females. Gunshot related death was also increased from 14% in 1996 to 25% in 2000. Over the same period, student university enrolment decreased from 7038 in 1996 to 3783 in 2000, a drop of nearly 50% [22].

In Ethiopia, mortality patterns from communicable and non-communicable diseases in Addis Ababa hospitals indicated that about 1.9% of deaths are attributed to suicide [23].

1.2. Associated Factors of Suicidal Ideation and Attempt

In South Korea, it was found that suicidal ideation was higher among those who are older than 50 years of age, less educated, divorce separated\widowed, and suffering from a co-morbid medical condition [24]. Similar studies from South Korea showed that insulin therapy duration in diabetes greater than or equal to 5 years of poor glycemic control [FBS≥126mg\dl] was significantly associated with suicidal attempt, whereas suicidal ideation was found higher among female patients (p=0.002). A history of alcohol abuse, other drug dependencies, and major depression past suicide attempts, and diagnosis of personality disorder have also been associated with suicide risk [32].

A cohort study in Sweden revealed the risk of suicide attempts in children with type 1 diabetes (hazard ratio [HR] 1.7 [95% CI 1.4–2.0]), and the risk for any psychiatric disorders was estimated to be HR 1.1 (95% CI 1.0–1.1) [9].

Suicidal ideation was found to be highly prevalent in those who had injected insulin in South Korea for more than 5 years [23].

Risk factor suicidality among diabetic patients in Canada was suicidal ideation (AOR=1.89, 95% CI: 1.36–2.63), attempted suicide AOR=1.45 (95% CI: 1.07–1.96), and completed suicide AOR= 1.85 (95% CI: 0.97–3.52) [33].

In Mexico, younger patients (AOR: 3.63, 95% CI: 1.29–10.19), having depression (AOR: 3.33, 95% CI: 1.13–9.76) and normal BMI (AOR: 3.14, 95% CI: 1.11–8.83), were predictive factors of suicide attempt [28].

In Italy, DM especially in patients with depressive symptoms was found to be significantly associated with a marked increase in suicidal behaviors and suicidal ideation [13].

A study reported in Ethiopia, Bahirdar, found that being female (AOR = 2.14, 95% CI:1.10,5.65), poor social support (AOR = 3.21, 95% CI:1.26,8.98), comorbid depression (AOR = 6.40,95% CI:2.56,15.46) and poor glycemic control (AOR = 4.38,95% CI:1.66,9.59) were factors associated with lifetime suicidal attempt in diabetic patients [25].

Despite the high magnitude of suicidal ideation and attempt among the different chronic medical populations in different countries, no data showed such impact in Ethiopia. Therefore, the study aims to assess the magnitude of suicidal behavior among patients with DM visiting chronic illness clinic at AGH, Tigray, Ethiopia.

2. MATERIALS AND METHODS

2.1. Study Design and Period

The institution-based cross-sectional study was conducted from May to June 2019 G.C.

2.2. Study Area

Alamata is one of the eight weredas in the south Tigray, located 187 km by Korem line, and 174 km by Mehoni line from Mekelle. Total population of the town is 62, 735 (male = 30,488 & female=32,247), total household is 18,451 and the annual increment of the population is 4.61%. Alamata General Hospital was founded in 1983E.C and 255 staff are enrolled. It gives service to a population of 165,205.

2.3. Source Population

All DM patients who were attending AGH.

2.4. Study Population

All DM patients who were attending Alamata General Hospital during the study period were included.

2.5. Inclusion and Exclusion Criteria

2.5.1. Inclusion Criteria

All DM patients who were 18 years old or above and attending at AGH were included in the study.

2.5.2. Exclusion Criteria

Those who were seriously ill, under the age of 18 and those with physical disabilities (unable to communicate) were excluded.

2.6. Sample size and Sampling Procedure

2.6.1. Sample Size Determination

The sample size was determined using a single population proportion formula by:

$$n = \frac{(z\,\alpha/2)^2 p\,(q)}{d^2}$$

Where n= sample size

z= confidence interval of 95%=1.96

d= marginal error; 0.05

$n=1.96^2(0.5)(1-0.5)/0.05^2$

=384

Since our sample population was less than 10,000 which was 200 we merged it to Nf using the correction formula

N= 200

Nf=n/1+n/N

=384/1+384/200

=132

Then, we added 10% of the Nf for the non-response rate.

132+14=**146** is the sample size we used to conduct our study.

2.7. Sampling Techniques

Convenience random sampling technique was used to select each study participants from the AGH and the data was collected until the quota was full.

2.8. Study Variables

2.8.1. Dependent Variable

- Suicidal behavior.

2.9. Independent Variables

2.9.1. Socio-demographic Factors

Age, sex, religion, ethnicity, marital status, educational status, occupational status, residence, living condition, income.

2.9.2. Psychosocial Factors

- Social support.
- Depression and anxiety.

2.10. Data Collection Method and Instruments

The study questionnaire had five components. Socio-demographic characteristics were collected by structured socio-demographic questionnaires. Depression and anxiety were collected by using HADS of seven stage questions and substance-related factors were collected by substance-related questionnaires. Social support was assessed by the Oslo-3 item social support scale, which is 3 item questionnaires, commonly used to assess social support and it has been used in several studies,

Outcome variables and suicidal behavior were assessed using a structured questionnaire. The data were collected through face-to-face interviews. There were 2 data collectors from fourth-year psychiatric nursing students. Data was collected in the AGH from May to June 2019.

2.11. Data Quality Control

To control the quality of the data, the questionnaire was designed and modified appropriately. The questionnaire was pre-tested one week before the actual data collection on 5% (8) of patients at AHC and was not included in the main survey. The data collectors were supervised daily and the field questionnaires were checked daily by the supervisors and principal investigator. When there was any problem the solution was given by discussion with the advisors and data collectors.

2.12. Data Analysis Technique

Data analysis technique and the collected data were analyzed using SPSS 23 software program. For this operation, proper data categorization and coding were used. For the analysis of obtained data, simple descriptive statistics (mean, percentage, frequencies, and standard deviation) and cross-tabulation were used to determine the magnitude of suicidal behavior among DM patients in AGH, Tigray, Ethiopia, 2019 G.C.

2.13. Operational Definition

Suicidal Behavior is defined if the respondent ever had either suicidal ideation or attempt.

Suicidal Ideation is defined as if the respondent answers the question have you ever seriously thought about committing suicide? If yes, the patient has suicidal ideation.

Suicidal Attempt is defined as if the respondent answers the question have you ever attempted suicide? If yes, the patient is likely to have a suicidal attempt.

Depression was assessed in individuals who scored≥8 on the depression subscale 7-items by assessing HADS.

Anxiety It was found in individuals, who scored ≥8 on anxiety subscale 7-items by assessing HADS.

Social Support: The presence of poor social support among medical patients was considered by the sum of the Oslo 3-item score of 3-8.

2.14. Ethical Consideration

Ethical clearance was obtained from the ethical review committee of Mekelle University. A formal letter of permission was obtained from MU and was submitted to AGH. The confidentiality of respondents was maintained. Informed written consent was obtained from each respondent and anyone not willing to take part in the study had full right to do so. Participants in the study who are highly suicidal were referred to the hospital for the assistant.

2.15. Dissemination and Utilization of a Result

After the data was analyzed, based on the findings obtained, conclusions and recommendations were made. Then the results of the study were submitted to AGH, Mekelle University, College of health science for future planning in routine assessments of mental health particularly suicide for a patient with DM in AGH. Moreover, the findings of the study were disseminated to the regional health bureau.

3. RESULTS

3.1. Socio-demographic Characteristics

The study compromised 146 diabetic patients, of which 113(77) were males. The majority 46(31.5) of the patients were between the age of 46-55 and the mean age was 44.91, 100(68.5) of them were orthodox Christian followers, 55 (37.7) have finished secondary school; more than half of the participants 79 (54.1) were married at the time of the study, nearly 1/3 of them, *i.e.*, 45 (30.8) were a private employee; more than 3/4 of them, *i.e.*, 113(77.4) were living with their family and most of them, *i.e.*, 67(45.9) were earning more than 3000 ETB per month (Table **1**).

Table 1. Socio-demographic characteristics of among people living with diabetes mellitus attending an outpatient department of Alamata general hospital, Mekelle, Tigray, Ethiopia 2019 (N=146).

Sr. No.	Variables	Response Category	Frequency	%
1	Sex	Male	113	77.4
		Female	33	22.6
2	Age	18-25	12	8.2
		26-35	22	15.1
		36-45	44	30.1
		46-55	46	31.5
		>55	22	15.1
3	Religion	Orthodox	100	68.5
		Muslim	46	31.5
4	Marital status	Single	34	23.3
		Married	79	54.1
		Widowed	33	22.5
5	Educational status	Unable to read & write	34	23.3
		Able to read & write	22	15.1
		Primary school	25	17.12
		Secondary school	55	37.7
		Diploma and university degree	10	6.82
6	Occupation	Unemployed	34	23.3
		Government employee	45	30.8
		Private employee	45	30.5
		Farmer	11	7.5
		Student	11	7.5
7	With whom are you living now	With family	113	77.4
		Alone	33	22.6

(Table 1) contd.....

Sr. No.	Variables	Response Category	Frequency	%
8	Average monthly income	Less than 1000	12	8.2
		1001-2000	55	37.7
		2001-3000	12	8.2
		Greater than 3000	67	45.9

Table 2. Magnitude of suicidal behaviour among people living with diabetes mellitus attending an outpatient department of Alamata general hospital, Mekelle, Tigray, Ethiopia 2019 (N=146).

Sr. No.	Variables	Response category	Suicidal behaviour	
			Yes	No
1	Sex	Male	23(20.4	90(79.6)
		Female	22(66.7)	11(33.3)
2	Age	18-25	0	12(100%)
		26-35	0	22(100%)
		36-45	11(25)	33(75)
		46-55	12(26.1)	34(73.9)
		>55	22(100%)	0
3	Religion	Orthodox	45(100%)	0
		Muslim	0	46(100%)
4	Marital status	Single	0	34(100%)
		Married	12(15.2)	67(84.8)
		Widowed	33(100%)	0
5	Educational status	Unable to read & write	23(67.6)	11(32.4)
		Able to read & write	11(50)	11(50)
		Primary school	0	35(100%)
		Secondary school	11(20)	44(80)
		Diploma and university degree	0	10(100%)
6	Occupation	Unemployed	22(64.7)	12(35.3)
		Government employee	0	11(100%)
		Private employee	0	45(100%)
		Farmer	11(100%)	0
		Student	12(26.7)	33(73.3)
7	With whom are you living now	With family	34(30.1)	79(69.9)
		Alone	11(33.3)	22(66.7)
8	Average monthly income	Less than 1000	12(100%)	0
		1001-2000	22(40)	33(60)
		2001-3000	0	12(100%)
		Greater than 3000	11(16.4)	50(83.6)
9	Depression	Yes	22(33.3)	44(66.7)
		No	23(28.8)	57(71.2)
10	Anxiety	Yes	22(33.3)	44(66.7)
		No	33(75)	11(25)
11	Poor social support	Yes	33(75)	11(25)
		No	12(11.8)	90(88.2)
12	Substance use	Yes	45(36.3)	79(63.7)
		No	0	22(100%)

3.2. The Magnitude of Suicidal Behavior

Of 146 participants with DM, 45(30.8%) had suicidal behavior whereas 69.2% of participants had no such behavior. Of the study participants who had suicidal behavior, 22(48.88) were above the age of 55, and 23(51.12) participants were male, 33(73.3) of them were widowed, 22(48.88) of them had depression, 23(51.12) had anxiety, 33(73.3) of them had poor social support, and all of them, *i.e.*, 45(100%) were substance users (Table **2**).

4. DISCUSSION

Suicide is a fatal act of terminating one's own life and it is a complex process that involves a series of pathways and mechanisms from initiation of ideation, to planning, and finally to attempting suicide [1]. The finding of this study showed that the overall magnitude of suicidal behavior among diabetes mellitus patients in Alamata General Hospital was 30.8%, which is within the range of study performed in the USA which was 58.5% [22] and 13.3% [23], respectively in the USA. A cross-sectional study was conducted in Korea to assess a one-year magnitude of suicidal ideation in adults older than 20 years of age with DM and depression by taking 17065 subjects. Suicidal ideation was assessed by the self-administered question have you ever had any suicidal thoughts over the past year? and the result showed that 51.4% of patients had suicidal ideation [24] which was significantly higher than our finding which might be due to cultural differences, lack of religiosity which is one of the protective factors of suicide, lifestyle, and psychosocial stressors. Our finding was significantly different from a finding in Australia which was 20% and this might be due to better living standards, better management of the illness, and less psychosocial stressors compared to Ethiopia. One study observed that the magnitude of suicidal behavior in patients with type 2 diabetes was 11.6% [34] which is significantly different to our finding and this might be due to difference in the study design which was case-control and it might also be due to the fact that study only included T2DM patients. Suicidal behaviors in DM are higher in those with a low level of education, female gender in Ethiopia [32], alcohol use, and cigarette smoking in the USA [26], which was similar to our finding.

Another cross-section study conducted in South Korea assessed the one-year magnitude of suicidal ideation in adults older than 20 years of age with both diabetes and depression. It was found that suicidal ideation was higher among those who are older than 50 years of age, less educated, divorced, and separated/widowed [24], which is similar to our finding.

In this study, 66.7% of females had suicidal behavior and100% of those who were above 55 years of age had suicidal behavior. All widowed participants showed suicidal behavior, and 67.6% of uneducated DM patients had suicidal behavior. Out of those who had poor social support, 75% had suicidal behavior, 33% of depressed DM patients had suicidal behavior and also 36.3% of substance users had suicidal behavior. Out of participants that had suicidal behavior, 15.8% had suicidal ideation, 14.4% had a suicidal attempt and 15.1% had the plan to commit suicide.

CONCLUSION

This study demonstrated that suicidal behavior problem in diabetic patients is of high magnitude especially in individuals with sociodemographic factors like being female, widowed, and poor social support.

LIST OF ABBREVIATIONS

AGH	=	Alamata General Hospital
CI	=	Confidence Interval
CMI	=	Co-morbid Medical Illness
DM	=	Diabetes Mellitus
ETB	=	Ethiopian Birr
GC	=	Gregorian Calendar
HIC	=	High Income
LMIC	=	Low and Middle Income
MU	=	Mekelle University
OPD	=	Out-patient Department
SBQR	=	Suicidal Behavior Questionnaire-Revised
SB	=	Suicidal Behavior
SPSS	=	Statistical Package for Social Science
WHO	=	World Health Organization
WMH	=	World Mental Health

AUTHORS' CONTRIBUTION

The principal investigator was AT. Study conception and design, material preparation, data collection, and analysis were executed by AT, WM, and BG. All authors read and approved the final manuscript.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

This study was carried out after obtaining ethical approval from Mekelle University, Ethiopia, College of Health Science office of Health Research Ethics Review Committee (HRERC) with the reference number of Notification of Expedited Approval ERC 1319/2019 and certifies that the study was executed by the ethical standards.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Verbal consent was obtained from each participant before starting data collection. Study participants had the right to withdraw from the study at any time and information was recorded anonymously.

AVAILABILITY OF DATA AND MATERIALS

The authors confirm that the data supporting the findings of this study are available within the article with approval no. 1319/2019.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

Our sincere thanks go to Mekelle University College of Health Sciences, department of internal medicine, and psychiatry for its provision of the chance to conduct this study. We would like to thank Alamata General Hospital staff for the information given on diabetic outpatient units and data used for this research, data collectors, and participants without whom this thesis would not have been realized.

REFERENCES

[1] Kaplan BJ. Kaplan and Sadock's synopsis of psychiatry. Behavioral sciences/clinical psychiatry. Tijdschr Psychiatr 2016; 58(1): 78-9.

[2] Lee J-I, Lee M-B, Liao SC, *et al.* Prevalence of suicidal ideation and associated risk factors in the general population. J Formos Med Assoc 2010; 109(2): 138-47. [http://dx.doi.org/10.1016/S0929-6646(10)60034-4] [PMID: 20206838]

[3] The organization, W. H. Preventing suicide: A global imperative 2014.

[4] Igwe MN, Uwakwe R, Ahanotu CA, Onyeama GM, Bakare MO, Ndukuba AC. Factors associated with depression and suicide among patients with diabetes mellitus and essential hypertension in a Nigerian teaching hospital. Afr Health Sci 2013; 13(1): 68-77. [http://dx.doi.org/10.4314/ahs.v13i1.10] [PMID: 23658570]

[5] Sarkar S, Balhara YPS. Diabetes mellitus and suicide. Indian J Endocrinol Metab 2014; 18(4): 468-74. [http://dx.doi.org/10.4103/2230-8210.137487] [PMID: 25143900]

[6] Braunwald E, Fauci AS, *et al.* Harrison's principles of internal medicine. McGraw Hill 2001.

[7] Batty GD, Kivimaki M, Park IS, Jee SH. Diabetes and raised blood glucose as risk factors for future suicide: cohort study of 1 234 927 Korean men and women. J Epidemiol Community Health 2012; 66(7): 650-2. [http://dx.doi.org/10.1136/jech-2011-200464] [PMID: 22301278]

[8] Jin H, Wu S, Vidyanti I, Di Capua P, Wu B. Predicting depression among patients with diabetes using longitudinal data. A multilevel regression model. Methods Inf Med 2015; 54(6): 553-9. [http://dx.doi.org/10.3414/ME14-02-0009] [PMID: 26577265]

[9] Butwicka A, Frisén L, Almqvist C, Zethelius B, Lichtenstein P. Risks of psychiatric disorders and suicide attempts in children and adolescents with type 1 diabetes: a population-based cohort study. Diabetes Care 2015; 38(3): 453-9. [http://dx.doi.org/10.2337/dc14-0262] [PMID: 25650362]

[10] Gylfadottir SS, Christensen DH, *et al.* Painful diabetic polyneuropathy and quality of life in Danish type 2 diabetic patients. Scand J Pain 2017; 16(1): 173-3. [http://dx.doi.org/10.1016/j.sjpain.2017.04.026]

[11] Chung JH, Moon K, Kim DH, Min JW, Kim TH, Hwang HJ. Suicidal ideation and suicide attempts among diabetes mellitus: The Korea National Health and Nutrition Examination Survey (KNHANES IV, V) from 2007 to 2012. J Psychosom Res 2014; 77(6): 457-61. [http://dx.doi.org/10.1016/j.jpsychores.2014.08.008] [PMID: 25258359]

[12] Davis WA, Starkstein SE, Bruce DG, Davis TM. Risk of suicide in Australian adults with diabetes: The fremantle diabetes study. Intern Med J 2015; 45(9): 976-80. [http://dx.doi.org/10.1111/imj.12853] [PMID: 26332624]

[13] Conti C, Mennitto C, Di Francesco G, Fraticelli F, Vitacolonna E, Fulcheri M. Clinical characteristics of diabetes mellitus and suicide risk. Front Psychiatry 2017; 8: 40. [PMID: 28348533]

[14] Wang B, An X, Shi X, Zhang JA. MANAGEMENT OF ENDOCRINE DISEASE: Suicide risk in patients with diabetes: a systematic review and meta-analysis. Eur J Endocrinol 2017; 177(4): R169-81. [PMID: 28512134]

[15] Foster HD. Suicide and mortality from diabetes. Am J Psychiatry 1988; 145(2): 272-2. [http://dx.doi.org/10.1176/ajp.145.2.272a] [PMID: 3341481]

[16] Goldston DB, Kelley AE, Reboussin DM, *et al.* Suicidal ideation and behavior and noncompliance with the medical regimen among diabetic adolescents. J Am Acad Child Adolesc Psychiatry 1997; 36(11): 1528-36. [PMID: 9394937]

[17] Handley TE, Ventura AD, Browne JL, *et al.* Suicidal ideation reported by adults with Type 1 or Type 2 diabetes: results from Diabetes MILES-Australia. Diabet Med 2016; 33(11): 1582-9. [http://dx.doi.org/10.1111/dme.13022] [PMID: 26525943]

[18] Tabb KM, Perez-Flores N, Wang Y, Huang H. The burden of suicidal ideation among persons with type II diabetes: A scoping review. J Psychosom Res 2017; 103: 113-8. [http://dx.doi.org/10.1016/j.jpsychores.2017.10.009] [PMID: 29167037]

[19] Deschênes SS, Burns RJ, Schmitz N. Comorbid depressive and anxiety symptoms and the risk of type 2 diabetes: Findings from the Lifelines Cohort Study. J Affect Disord 2018; 238: 24-31. [http://dx.doi.org/10.1016/j.jad.2018.05.029] [PMID: 29852343]

[20] Borges G, Nock MK, *et al.* Twelve-month prevalence of and risk factors for suicide attempts in the WHO World Mental Health Surveys. J Clin Psychiatry 2010; 71(12): 1617. [http://dx.doi.org/10.4088/JCP.08m04967blu] [PMID: 20816034]

[21] Fekadu A, Medhin G, Selamu M, *et al.* Non-fatal suicidal behaviour in rural Ethiopia: a cross-sectional facility- and population-based study. BMC Psychiatry 2016; 16(1): 75. [http://dx.doi.org/10.1186/s12888-016-0784-y] [PMID: 27000122]

[22] Roy A, Roy M, Janal M. Suicide attempts and ideation in African-American type 1 diabetic patients. Psychiatry Res 2010; 179(1): 53-6. [http://dx.doi.org/10.1016/j.psychres.2010.06.004] [PMID: 20630602]

[23] Han SJ, Kim HJ, Choi YJ, Lee KW, Kim DJ. Increased risk of suicidal ideation in Korean adults with both diabetes and depression. Diabetes Res Clin Pract 2013; 101(3): e14-7. [http://dx.doi.org/10.1016/j.diabres.2013.06.012] [PMID: 23871574]

[24] Goldston DB, Kovacs M, Ho VY, Parrone PL, Stiffler L. Suicidal ideation and suicide attempts among youth with insulin-dependent diabetes mellitus. J Am Acad Child Adolesc Psychiatry 1994; 33(2): 240-6. [http://dx.doi.org/10.1097/00004583-199402000-00013] [PMID: 8150796]

[25] Necho M, Mekonnen S, Haile K, Birkie M, Belete A. Suicidal plan, attempt, and associated factors among patients with diabetes in Felegehiwot referral hospital, Bahirdar, Ethiopia: cross-sectional study. BMC Psychiatry 2019; 19(1): 258. [http://dx.doi.org/10.1186/s12888-019-2253-x] [PMID: 31455263]

[26] Scocco P, de Girolamo G, Vilagut G, Alonso J. Prevalence of suicide ideation, plans, and attempts and related risk factors in Italy: results from the European Study on the Epidemiology of Mental Disorders--World Mental Health study. Compr Psychiatry 2008; 49(1): 13-21. [http://dx.doi.org/10.1016/j.comppsych.2007.08.004] [PMID: 18063036]

[27] Chikezie U, Okogbenin E, *et al.* Patterns of comorbid infections and associated suicidal ideations among individuals attending an HIV/AIDS clinic in Benin City. Epidemiology 2013; 3(4)

[28] Gómez-Peralta TG, González-Castro TB, Fresan A, *et al.* Risk factors and prevalence of suicide attempt in patients with type 2 diabetes in the Mexican population. Int J Environ Res Public Health 2018; 15(6): 1198. [http://dx.doi.org/10.3390/ijerph15061198] [PMID: 29880751]

[29] Webb RT, Lichtenstein P, Dahlin M, Kapur N, Ludvigsson JF, Runeson B. Unnatural deaths in a national cohort of people diagnosed with diabetes. Diabetes Care 2014; 37(8): 2276-83. [http://dx.doi.org/10.2337/dc14-0005] [PMID: 24848285]

[30] Song H-B, Lee S-A. Socioeconomic and lifestyle factors as risks for suicidal behavior among Korean adults. J Affect Disord 2016; 197: 21-8. [http://dx.doi.org/10.1016/j.jad.2016.02.035] [PMID: 26967916]

[31] Park S, Jang H. Correlations between suicide rates and the prevalence of suicide risk factors among Korean adolescents. Psychiatry Res 2018; 261: 143-7. [PMID: 29306174]

[32] Shibre T, Hanlon C, Medhin G, *et al.* Suicide and suicide attempts in people with severe mental disorders in Butajira, Ethiopia: 10 year follow-up of a population-based cohort. BMC Psychiatry 2014; 14(1): 150. [PMID: 24886518]

[33] Elamoshy R, Bird Y, Thorpe L, Moraros J. Risk of depression and suicidality among diabetic patients: a systematic review and meta-analysis. J Clin Med 2018; 7(11): 445.

[PMID: 30453557]
[34] Romero-Pimentel AL, Mendoza-Morales RC, Fresan A, *et al.* Demographic and clinical characteristics of completed suicides in Mexico City 2014–2015. Front Psychiatry 2018; 9: 402. [PMID: 30245640]