Level of Glycemic Control and Its Associated Factors among Type II Diabetic Patients in Debre Tabor General Hospital, Northwest Ethiopia

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Abstract

Introduction: Poor glycemic control is the major risk factor for the development of acute and chronic diabetes complications. There are limited studies on the level of glycemic control among diabetes and its associated factors. So, the aim of this study was to assess the level of glycemic control and its associated factors among type II DM patients in Debre Tabor General Hospital.

Methods: An institution based cross-sectional study was conducted from November 1-30, 2017on 413 diabetic patients who were selected by systematic random sampling. The three months average fasting blood glucose was used to determine glycemic control. Regressions were fitted to identify associated factors. P-value <0.05 was used to declare statistical significance.

Results: A total of 398 study participants were participated in the study with a response rate of 96.4%. Among 398 type II DM patients, 284 (71.4%) had poor glycemic control. patient's educational status (AOR= 3.0, 95%CI (1.5, 5.7), (AOR= 4.5, 95%CI (1.8, 10.9), and (AOR= 5.7, 95% CI (2.9, 11.2)))), family history of DM (AOR= 2.3, 95%CI (1.4, 3.9)), Duration of DM since diagnosis (AOR= 0.3, 95% CI (0.1, 0.9)), and Dietary adherence(AOR= 2.4, 95% CI (1.4, 4.1)) were associated factors of glycemic control.

Conclusion: Poor glycemic control was high. Educational status, family history of DM, duration of DM, and dietary adherence were independent predictors of glycemic control. Appropriate attention should be given for glycemic control especially for patients with a longer duration. Health promotion should be cross-cutting intervention for DM patients about medical recommendations.

Keywords: Type II DM, Glycemic control, Fasting blood glucose, Debre Tabor General Hospital

Introduction

Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-Imation and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-Imation and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global- Imation and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-ization and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-ization and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-ization and epidemiologic transition Non-communicable diseases are becoming major problems of public health importance in most developing countries as a result of the effects of global-ization and epidemiologic transition.

Diabetics Mellitus is a raised level of glucose in the blood due to either the body cannot produce enough amount of insulin hormone or use insulin effectively [1]. The global prevalence and impact of diabetes mellitus has increased dramatically, particularly in sub-Saharan Africa and it is one of the major public health problem in developing countries due to the most rapid epidemiological transitions [2-5].

In 2012 diabetes mellitus, caused 1.5 million deaths worldwide among this 43% befall before the age of 70 years [1]. Globally it is estimated that 425 million people live with diabetes aged 20-79 years, 90% of whom accounts type 2 diabetes mellitus, and it will raise 642 million by 2040 [6-8].The prevalence of diabetes in Africa has raised from 4 million in 1980 to 25 million in 2014, which increased by 129% (3.1% in 1980 to 7.1% in 2014)and Ethiopia accounts 3.8%, and 9% in gestational diabetes mellitus [9]. In sub-Saharan Africa, 90% of people living with type 2 diabetes mellitus typically associated with increasing age and obesity [9, 10].

Diabetics Mellitus has a wide range of medical complication such as retinopathy, neuropathy, micro albuminuria, and it increases the risk of numerous infectious disease including tuberculosis, pneumonia, and sepsis particularly in Sub-Saharan Africa [9]. Glycemic control remains the major focus for the management of type 2 diabetes mellitus [11]. Poor glycemic control among type 2 diabetes mellitus patients constitutes a major public health problem and a risk factor for the development of acute and chronic diabetes complications [12-14].Studies evidenced thatgood glycemic control reduces the risk of diabetic related complications and death [15, 16].

Despite, of the importance of good glycemic control evidence showed that there is poor glycemic control in Ethiopia [17-20]. Different studies evidenced that being unable to read and write, farmer, having poor medication adherence, duration with diabetics, and duration of diabetics treatment were the significant associated factors for poor glycemic control among type 2 diabetic patients [12, 20-22]. The aim of this study was to assess the level of glycemic control and its associated factors among type 2 diabetic patients attending their follow up at Debre Tabor General Hospital, Northwest Ethiopia.

Methods and Participants

Study Design, Area and Period
Institutional based cross-sectional study design was conducted from November01/2017- November 30/2017 at Debre Tabor General Hospital. Debre Tabor General Hospital is found in Debre Tabor Town, South Gondar Zone of Amhara Regional state that is about 667 kilometers far from the capital city of Ethiopia in Northwest direction and 102 kilometers far from Bahir Dar town.

A total of 413 study participants were included. The sample size was calculated by using single population proportion formula considering the prevalence of poor glycemic control is 57.5% among type 2 diabetic patients from previous study

done in Ethiopia, 95% confidence level and 5% of marginal error by adding none response rate of 10%. Systematic random sampling technique was employed to select the study participants. A total of 850 type 2 diabetic patients had follow up at Debre Tabor General Hospital, and then we calculate the Kth interval that was 2. So, we interview the study participants every 2 type 2 diabetic patients [23]. All type 2 diabetic patients aged ≥ 18 years who had at least one-year outpatient follow up at Debre Tabor General Hospital were included in the study, whereas newly diagnosed type 2 diabetic patients, critically ill and unable to speak and hear at the time of data collection were excluded from the study.

Data Collection

The data was collected by two trained nurses by face-to-face interview by using pre-tested and structured questionnaire. Patient chart review was carried out to determine of three-month average Fast Blood Sugar (FBS) and diabetics related complications. The dietary adherence status was assessed by Perceived Dietary Adherence Questionnaire (PDAQ), and diabetic related knowledge assessed by Diabetes Knowledge Test (DKT) questionnaire [24-26].

Data processing and analysis:

The collected data were entered into EpiData version 3.1 and double entry was made. The entered data were exported to Statistical Package for Social Science (SPSS) version 20 software for analysis. Descriptive statistics was employed for sociodemographic characteristics of the respondents. Bivariate and multivariable logistic regression was done to identify independent factors of glycemic control. P-value less than 0.2 was used to select candidate variables for multivariable logistic regression. Hosmer and Lemeshow's goodness-of-fit test was used to check the data is appropriate for multiple logistic regression model. Crude Odds Ratio (COR), Adjusted Odds Ratio(AOR) with 95%CI were employed to determine the associated factor of type 2 diabetic patient glycemic control and P- value less or 0.05 was considered as statically significant.

Operational Definitions

Good glycemic control was defined as an average of three consecutive fasting blood glucose measurement 80–130 mg/dl. Poor glycemic control was defined as patients who's had average blood glucose measurements on three consecutive visits > 130 or < 70 mg/dl [27]. The Perceived Dietary Adherence Questionnaire (PDAQ) is 9-item seven-point Likert scale questionnaires assessing the dietary adherence status of the last seven days. PDAQ has a total of 63 scores for 9-item questions, and for each item, a higher score reflects higher dietary adherence except item 4 and 9, which is reversely coded. To declare good dietary adherence having a total sum scores of ≥ 31.5scores. Diabetes Knowledge Test (DKT) questionnaire has a 23-item multiple-choice questions. Item 1-14 designed for all adult diabetic patients. The DKT score

was determined by dividing the number of correct answers by the total number of questions (14 for those receiving oral hypoglycemic agents). Scores having ≥75 %, 74-60 % and ≤59 %, were used to declare good, medium and poor diabetic related knowledge respectively. Respondents having good and medium diabetic related knowledge were merged in to good diabetic related knowledge [28, 29].

Ethical Consideration:
The study was conducted after getting ethical clearance letter from Debre Tabor University College of Health Sciences. The data were collected after obtaining permission from Debre Tabor General Hospital medical director and chief executive director. Informed consent was obtained from each study participants. The name of the study participants was not registered for the assurance of confidentiality and social desirability bias. Individuals are informed that they could withdraw at the time of interview.

Results

Socio-demographic and Clinical Characteristics of the respondents:
A total of 398 study participants were participated in the study with a response rate of 96.4%. Majority of the study participants were males 211 (53 %). The mean (± SD) age of patients with type 2 diabetes was 52.63 (± 12.34) years. Most of the respondents were orthodox 357 (89.7 %) in religion and 283 (71.1 %) of the study participants had family history of diabetes mellitus (Table 1).

	Variables	Frequency	Percent (%)
Sex	Male	211	53.0
	Female	187	47.0
Age	18 – 34 years	10	2.5
	35 – 50 years	189	47.5
	51 – 64 years	128	32.2
	≥ 65 years	71	17.8
Marital Status	Single	44	11.1
	Married	272	68.3
	Divorced	71	17.8
	Separated	11	2.8
Religion	Orthodox	357	89.7
	Protestant	7	1.8
	Muslim	34	8.5
Residence	Urban	234	58.8
	Rural	164	41.2
Educational Status	Unable to read and write	177	44.5
	Able to read and write	75	18.8
	Primary Education	30	7.5
	Secondary Education	45	11.3
	Higher Education and above	71	17.8
Occupational Status	Government Employee	89	22.4
	Merchant	74	18.6
	Farmer	142	35.7
	NGO	34	8.5
	House Wife	59	14.8
Family history of DM	No	283	71.1
	Yes	115	28.9
Distance from the Hospital	≤ 30 minutes	144	36.2
	>30 minutes	254	63.8
Smoking	Yes	16	4.0
	No	382	96.0

Table 1: Socio-demographic Characteristics of Patients with Type 2 Diabetes Mellitus Attending their Follow up at Diabetic Clinic of Debre Tabor General Hospital, Ethiopia, 2017. (n=398)

Level of glycemic Control and Clinical Characteristics of the Respondents:

Out of 398 study participants, 71.4 % had poor glycemic control. The mean (± SD) of fasting blood glucose was 175.52 (± 69.34) mg/dl with inter quartile range of (213- 124). The mean duration of DM since diagnosis with diabetes mellitus and starting of treatment was 5.32 and 5.18 years respectively. Among the total of respondents having glucometer at home (34.9 %)had good glycemic control compered to not having glucometer at home which is 26.9 % (Table 2).

	Variables	Glycemic Control Level				
		Poor	N (%)	Good	N (%)	Total N
Sex	Male	146	(69.2)	65	(30.8)	211
	Female	138	(73.8)	49	(26.2)	187
Resident	Urban	157	(67.1)	77	(32.9)	234
	Rural	127	(77.4)	37	(22.6)	164
Duration of DM Treatment	1-5 years	161	(65.2)	86	(34.8)	247
	6-10 years	90	(78.9)	24	(21.1)	114
	> 10 years	33	(89.2)	4	(10.8)	37
Number of medication taken per day	One	69	(59.5)	47	(40.5)	116
	Two and above	215	(76.2)	67	(23.8)	282
Having glucometer at home	No	228	(73.1)	84	(26.9)	312
	Yes	56	(65.1)	30	(34.9)	86
Chronic illness	No	178	(73.9)	63	(26.1)	241
	Yes	106	(67.5)	51	(32.5)	157
Dietary adherence status	Poor Adherence	99	(78.-6)	27	(21.4)	126
	Good Adherence	185	(68.0)	87	(32.0)	272

Table 2: Socio-demographic and clinical characteristics of patients with type 2 diabetes mellitus patients attending their follow up at diabetic clinic of Debre Tabor General Hospital, Ethiopia, 2017. (n=398)
Factors associated with glycemic control

In bivariate logistic regression, age of the patient, marital status, residence, educational status, family history of DM, duration of DM since diagnosis, ever had diabetic education, and dietary adherence were significantly associated factors with glycemic control among type II DM patients. In multivariable logistic regression, patient's educational status, family history of DM, Duration of DMsince diagnosis, and Dietary adherence were significantly associated with glycemic control among type II diabetic patients.

Diabetic patients who can read and write are 3 times more likely to have good glycemic control as compared with those who couldn't read and write (AOR= 3.0, 95%CI (1.5, 5.7)). Type II Diabetic patients who learnt up to primary educational level are 4 times more likely to have good glycemic control as compared with those who couldn't read and write (AOR= 4.5, 95%CI (1.8, 10.9)). Diabetic patients who achieve college and above educational status are 5.7 times more likely to have good glycemic control as compared with those who couldn't read and write (AOR= 5.7, 95% CI (2.9, 11.2)).

Type II diabetic patients who have family history of diabetes mellitus are 2.1 times more likely to have good glycemic control as compared with those who didn't have family history of diabetes mellitus (AOR= 2.3, 95%CI (1.4, 3.9)). Type II diabetic patients with greater than 10 years duration since diagnosis are 70% less likely to have good glycemic control as compared with those with less than 5 years duration of diabetes mellitus since diagnosis (AOR= 0.3, 95% CI (0.1, 0.9)).

Diabetic patients who have good dietary adherence are 2.4 times more likely to have good glycemic control as compared with those who have poor dietary adherence (AOR= 2.4, 95% CI (1.4, 4.1)). (Table 3)

Variables		Poor Glycemic Control	Good Glycemic Control	COR (95% CI)	AOR (95% CI)
Age of the patient	18-34 years	3	7	7.4 (1.7,31.9)	
	35-50 years	128	61	1.5 (0.8,2.8)	
	51-64 years	99	29	0.9 (0.5, 1.8)	
	Above 65 years	54	17	1	
Marital status	Single	22	22	1	
	Married	197	73	0.4 (0.2-0.7)	
	Divorced	56	15	0.3 (0.1-0.6)	
	Separated	7	4	0.6 (0.1-2.2)	
Residence	Urban	157	77	1	
	Rural	127	37	0.6 (0.4-0.9)	
Educational Status	Un able to read and write	149	27	1	1
	Able to read and write	50	25	2.6(1.4,5.0)	3.0 (1.5, 5.7)
	Primary Education	17	13	4.1 (1.8,9.3)	4.5 (1.8, 10.9)
	Secondary Education	34	11	1.7 (0.8, 3.8)	2.2 (1.0, 5.0)
	College and above	34	37	5.8 (3.1, 10.7)	5.7 (2.9, 11.2)
Family history of DM	No	215	68	1	1
	Yes	69	46	2.1 (1.3, 3.3)	2.3 (1.4, 3.9)
Duration of DM since diagnosis	Less than 5 years	155	86	1	1
	5- 10 years	89	24	0.5 (0.3, 0.5)	0.6 (0.3, 1.0)
	Greater than 10 years	40	4	0.2 (0.1,0.5)	0.3 (0.1, 0.9)
Ever had Diabetic Education	No	44	240	1	
	Yes	10	104	2 (0.9, 3.9)	
Dietary adherence	Poor	99	27	1	1
	Good	185	87	1.7 (1.1, 2.8)	2.4 (1.4,4.1)

Table 3: Factors associated with glycemic control among type 2 diabetes mellitus patients attending their follow up at diabetic clinic of Debre Tabor General Hospital, Ethiopia, 2017. (n=398)

Discussion

Chronic non communicable diseases are becoming the problems of low and middle income countries including Ethiopia due to numerous reasons. Diabetes contributes the greatest line share of chronic non communicable diseases. Glycemic control is the most important diabetes care and management for diabetic patients. Poor glycemic control is a major health problem which greatly contributes for the development of diabetes-related complications.

The result of this study showed that the level of glycemic control among type II diabetic patients is 71.4% which is consistent with the study done at Dessie Referral hospital (70.8%), Jimma University teaching Hospital (70.9%), Turkey (67.5), Myanmar (72.1%), and Saudi Arabia (74.9%)(12,20,30–32). Whereas it is below than the study conducted at TikurAnbessa hospital (80%), South Africa (83.8%), Kenya (81.6%), India (91.8%) and Palestine (80.5%)(33–37).On the other hand, it is higher than the study done at Zambia (61.3%), Limmu Genet Hospital (63.8%), Suhul Hospital (63.5%), Nigeria

(55%), Ayider Specialized hospital (48.7%) and Shenen Gibe Hospital (59.2%)(21,38–42). The possible justification for the discrepancy might be the difference in quality of care given for the patients in different hospitals that studies were conducted and the method used to assess the glycemic level.

The result of our study revealed that educational status of type II diabetic patients had significant association with glycemic control. Diabetic patients who can read and write, learnt primary school and achieve college and above educational status are 3, 4 and 5.7 times more likely to have good glycemic control as compared with those who couldn't read and write respectively. This is consistent with study conducted at Dessie Referral Hospital, Jimma University Teaching Hospital and Shenen Gibie Hospital [20, 21, 30-39]. The reason might be educational status may affect patients adherence to medical recommendations.

This study indicated that family history of diabetes mellitus had associated with glycemic control of diabetes mellitus. Type II diabetic patients who have family history of diabetes mellitus

are 2.1 times more likely to have good glycemic control. This finding is similar with the study conducted at Saudi Arabia [32]. The probable reason might be diabetes patients with family history of diabetes mellitus may have better information about medical recommendations for diabetes patients.

Our study showed that duration of diabetes since diagnosis had significant association with glycemic control of type II diabetes patients. Type II diabetic patients with greater than 10 years duration since diagnosis are 70% less likely to have good glycemic control as compared with those with less than 5 years duration of diabetes mellitus since diagnosis. This is in line with studies done at Tikur Anbessa Hospital, Dessie Referral Hospital, South Africa, Limmu Genet Hospital, Malaysia, Ayider Referral Hospital, Palestine, Jordan, and SaudiArabia [30, 32, 33, 37, 39, 40-43]. The possible justification may as the duration increases the ability to secret insulin will decrease in type II diabetes mellitus and age by itself may be contribution.

The result of this study revealed that adherence to dietary recommendation had significant associated with glycemic control among type II diabetes patients. Diabetic patients who have good dietary adherence are 2.4 times more likely to have good glycemic control as compared with those who have poor dietary adherence. This finding is consistent with the study conducted at Suluh Hospital and India [18, 36].

Conclusion and recommendations
Level of glycemic control among type II diabetes patients were poor. Educational status, having family history of DM, duration of DM since diagnosis and dietary adherence to dietary recommendations were independent predictors of glycemic control among type II DM patients.

During diabetes patient follow up, clinicians should give appropriate attention for glycemic control since it is the main goal of diabetes management. Special attention should be given for DM patients with longer duration. Health professionals shall put their effort on evidence generation, health promotion and awareness creation about diabetes mellitus and its control.

Data Availability
We have the data of this research article and can provide it as per the request.

Competing Interests
We declare that we have no competing interests.

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We didn't receive any kind of fund for this research.

Authors' Contributions
All stated authors AD, SA, AA, HG, BA, and MT are involved in the study from the inception to design, acquisition of data, analysis and interpretation and drafting of the manuscript. All authors read and approved the final manuscript.

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