

Status Of Glycemic Control And Factors Associated With Poor Glycemic Control Among Diabetic Adult Out-Patients, in Hiwot Fana Specialized University Hospital, Harar, Ethiopia

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Abstract:

Diabetes is increasing rapidly throughout the world especially in developing countries most likely because of rapid increase in urbanization, aging of the population and sedentary life style. Most diabetes patients had poor glycaemic control worldwide especially in SSA and continues to be a major challenge. Glycemic control is the most important predictor of diabetic related complications and deaths. Identifying factors associated with glycemic control help health care providers and patients to focus on areas that decrease causes of poor glycemic control, diabetic related complications and deaths. Despite this growing prevalence of diabetes and its complications, data regarding glycemic control is scarce and little is known about the factors contributing for poor glycemic control especially in Ethiopia. Such researches are of great relevance for planning healthcare programs targeting improved diabetes control. Thus assessing glycaemic control and associated factors in Eastern Ethiopia is important because there are different habits of the people, different way of life than the rest of parts of Ethiopia and undiagnosed DM is also high in this area so, the aim of this study were To assess the status of glycemic control and factors associated with poor glycemic control among diabetic adult out-patients at Hiwot Fana Specialized University Hospital, Harar, Eastern Ethiopia Hospital- based cross sectional study was used . Data was collected by using systematic random sampling technique. data were entered in to epidata 3.1 and exported into SPSS version 22 for analysis. Bivariate and multivariate analysis was done to investigate variables contributed for poor glycemic control. In This study more than two-third (73%) of diabetic patients had poor glycemic control. Study participants who are getting formal education (AOR = 9.57, 95% CI (1.87-14.94) , who are only on oral hypoglycemics (AOR = 3.104, 95% CI 2.087-11.231), khat chewers (AOR = 8.22, 95% CI 6.254-13.867), type two DM (AOR = 6.003, 95% CI 4.231-13.915) and noncompliance to proper diet (AOR = 4.83, 95% CI 7.831-11.562) were significantly associated with poor glycemic control. These findings shows the need for proper management of patients focusing on the identified associated factors for poor glycemic control should be the primary goal to maintain ideal level of glycemic control. These results showed that we need to strengthen our effort on optimum management of diabetes and associated factors, since good glycemic control is main therapeutic goal for all patients with diabetes to prevent or decrease diabetic related complications.

Keywords: status of glycemic control; diabetic complications; poor glycemic control.

1. Introduction

Diabetes mellitus (DM) is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbance in carbohydrate, protein and fat metabolism resulting from defect in insulin secretion, insulin action or both (Craig et al., 2009, Nathan et al., 2009). Diabetes is one of the common non-communicable disease with high prevalence and risks of lifelong chronic complications. According to International Diabetes Federation (IDF) 1.9 million adults aged 20-79 year had diabetes in 2013 and another 2.9 million people had impaired glucose tolerance who are more likely to develop diabetes in Ethiopia with national prevalence of 4.36% and there were about



diabetes related deaths in the same year because of poor glycaemic control related complications (Guariguata et al., 2011). National Survey conducted in 2015 in Ethiopia showed the prevalence of DM or raised blood sugar in the adult population is 6% and majority of them had poor glycaemic control (Tekalegn et al., 2018).

The most common causes of morbidity and mortality in uncontrolled diabetes are because of renal failure, coronary artery diseases and direct consequences. Glycaemic control is the main goal in all diabetic patients in preventing complications arising from diabetes. Several large prospective studies and clinical trials established the benefits of intensive diabetes management in reducing (Guariguata et al., 2011) its complications and reduce life expectancy and quality of life. Most studies showed that tight control of diabetes is very important, but majority of patients do not attain ideal blood glucose level. Reasons for poor glycaemic control is complex and multifactorial of which both patient and healthcare provider related factors may contribute to poor glycaemic control. Even though DM prevalence is high in Ethiopia, there is no nationwide study on status of glycaemic control so this study will show status of glycaemic control in Eastern Ethiopia.

According to American Diabetic Association (ADA, 2018), good glycaemic control is defined as Glycosylated Hemoglobin (HbA1c) value of 7 % or less or fasting blood glucose level of 80-130 mg/dl for the past three months and Poor glycaemic control is defined as HbA1c value of more than 7 % or fasting blood glucose level of < 80 mg/dl and > 130 mg/dl for non-pregnant adults for the past three months in young and uncomplicated DM or without comorbid patients. Fasting blood sugar is defined as blood glucose level measured from venous blood after 8 hours of overnight fasting or longer (IDF, 2015).

Hence, assessing magnitude of glycaemic control and factors associated with poor glycaemic control are important in order to design hospital based protocol preparation and to inform clinicians for disease management in an effort to stop or decrease DM related complications, cost of treatment and death among affected individuals within the community. However, despite diabetes treatment is being practiced in HFSUH for longer periods of time, trends of the disease, status of glycaemic control and associated factors have not been assessed yet in this area. Therefore, the aim of this study will help to narrow this gap and will use as cornerstone for future plans and researches. After assessing status of glycaemic control and identifying factors associated with poor glycaemic control, possible intervention methods will be formulated and applied to improve status of glycaemic control and decrease or delay DM related complications and associated factors (IDF, 2015).

2. Methods

2.1 Study Area and Period

The study was conducted in Harar, one of the most popular historical cities in the Eastern part of Ethiopia, surrounded by the State of Oromia.

Harar, the capital city of the HNRS is located 526 KM from the capital Addis Ababa. According to the current regional health bureau, there are two government Hospitals, Army Hospital, Federal Police Hospital, two private Hospitals, one non-government (Fistula) hospital, eight Health Centers, twenty nine private clinics, twenty six health posts and one regional laboratory

serving the people of the state and Eastern Ethiopia. Hiwot Fana Hospital is one of the two government Hospitals. It serves as the Referral Hospital of the State and East Harage, thus expected to serve about 5.8 million catchment population.

2.2 Study Design

Hospital- based cross sectional study was used.

2.3 Source population

All diabetic out patients visiting diabetic clinic at HFSUH

2.3.1 Study population

All randomly selected diabetic out patients visiting diabetic clinic at HFSUH

2.4 Inclusion and Exclusion Criteria

2.4.1 Inclusion Criteria

All diabetic patients having follow-up at HFSUH aged ≥ 18 years old

2.4.2 Exclusion Criteria

- ◆ Those who are critically ill and unable to participate in the interview
- ◆ Those who are recently diagnosed and less than 3 months since diagnosis
- ◆ Those who had no 3 consecutive follow-
- ◆ Those who are currently pregnant

2.5 Sample Size

The sample size was determined by using the following formula

$$n = Z^2 \frac{P(1-P)}{W^2} \quad \text{and}$$

Where n= minimum sample size required

P= Proportion of population (prevalence rate), taken from a similar study done in Dessie Referral Hospital in Northeast Ethiopia, from January to April 2017, which was 70% (0.7) (Fiseha et al., 2018).

W=Margin of error expressed in proportion (0.05)

N_f = final sample

$$n = \frac{(1.96)^2 \times 0.7 \times (1-0.7)}{(0.05)^2} \quad n = 323$$

Adding 10% non-response rate to the above figure

$$N_f = \frac{323 \times 10}{100} = 32.3 \sim 32 \quad 323 + 32 = 355$$

2.6. Sampling Procedure and Sampling Technique

The diabetic adult outpatient follow-up clinic works three times per week throughout the year (12 months) and the months were selected by conventional method. There are a total of 879 diabetic patients having follow up at HFSUH and in every month about 450 patients visit the adult diabetic outpatient clinic. The two months follow-up schedule was chosen for data collection to avoid repetition of cases as patients revisit the clinic every 1-3 months. So the study subjects were selected with even card numbers by systematic random sampling technique method who had follow-up appointment on the months of December 16, 2019 to February 16, 2020 and the months were selected by using conventional method because having follow up in this period was also a chance.



2.7. Data Collection Methods

Data were collected by four data collectors and two supervisors who are responsible in coordinating the overall process. Structured questionnaires were prepared in English initially and was translated to local language Amharic by a person who had the good ability of both languages and was back translated into English and filled by the data collectors after written consent was taken from all study participants and were interviewed by using pre-designed, pre-structured questionnaire and some of the required information were obtained from the medical record charts which had basic information like patients' age, sex, type of diabetes, type of medication they are taking, level of FBS and duration of diabetes. Weight in kilogram and height in meter were measured at the time of interviewing and body mass index (BMI) was calculated in kilogram per meter square (kg/m^2). Pretesting of questionnaires was done on similar but different population prior to the actual survey. Questions were revised based on the feedback from the pretest. In the meantime, logistic arrangement and coordination of the data collection was made by visiting the adult outpatient diabetes clinic. Data collectors were trained. With the help of staffs working in the clinic, selected patients were identified and informed about the purpose of the study and written consent was ensured. The volunteering selected patients were briefed on the purpose of the study. The supervisor in the meantime should have to insure the data quality with close supervision of the data collection process.

2.8 Variables

Dependent Variable:

The dependent variables tested in this study was level of poor glycemic control.

Independent Variables:

Age, sex, educational level, religion, and experience, type of diabetes, duration of diabetes, economical status were the main independent variables believed to affect the dependent variables.

2.9 Ethical Consideration

Ethical clearance was secured from the Ethical committee of Haramaya University College of health and medical sciences, Department of Community Health. Official permissions were asked from HFSUH administration and outpatient director. The ethical board was approved the proposal and official permission letter was obtained from HFSUH administration. Respondents were informed well about the study, written voluntary and signed consent was obtained by signing on the prepared consent sheet from each participant patient and were included those who were willing to participate in this study. Information is held confidential.

3. Results

This study included 355 participants, of which 198 (55.8%) were females and the majority 160(45.1%) were Oromo followed by Amhara 152(42.8) and 181(51%), 138(38.9%) were Orthodox and Muslims respectively (Table 1).

Table 1: Socio-demographic characteristics of study participants attending diabetic follow-up clinic in HFSUH, Eastern Ethiopia, 2019

Characteristics (N=355)	Categories	n (%)
1. Age group	18-30 years	42(11.8)
	31-69 years	286(80.6)
	≥ 70 years	27(7.6)
2. Sex	Male	157(44.2)
	Female	198(55.8)
3. Religion	Orthodox	181(51)
	Muslim	138(38.9)
	Protestant	34(9.6)
	Others	2(0.5)
4. Ethnicity	Amhara	152(42.8)
	Oromo	160(45.2)
	Gurage	25(7)
	Tigre	9(2.5)
	Others	9(2.5)
5. Marital status	Single	23(6.5)
	Married	243(68.5)
	Divorced/Widowed	89(25)
6. Residence	Urban	263(74.1)



	Rural	92(25.9)
7. Occupation	Employed	84(23.7)
	Merchant	44(12.4)
	Housewife	81(22.8)
	Farmer	62(17.5)
	Retired	73(20.6)
	Others	11(3.1)
8. Educational status	Illiterate	95(26.8)
	Read & write	23(6.5)
	1-8	100(28.2)
	9-12	60(16.9)
	College & above	77(21.7)
9. Monthly income	<500 ETB	32(9)
	500-1000 ETB	69(19.4)
	>1000 ETB	254(71.5)
10. BMI	<25	118(33.2)
	≥25	237(66.8)
11. Waist circumference	<102/88	128(36.1)
	>102/88	227(63.9)

Table 2: Diabetic self-care activity characteristics of study participants attending diabetic follow-up clinic in HFSUH, Eastern Ethiopia, 2019

Characteristics (N=355)	Categories	n (%)
1. Regular physical exercise	>3 days (adequate)	233(65.6)
	0-3 days (inadequate)	122(34.4)
2. Self-monitoring blood glucose	Yes	5(1.4)
	No	350(98.6)
3. Adherence to medications	Yes	321(90.4)
	No	34(9.6)
4. If no, reason	Fear of side effect	6(17.6)
	Feeling dose is too high/low	1(3)
	They feel healthy	27(79.4)
5. Regular follow up	Yes	322(90.7)
	No	33(9.3)
6. Compliance to diet	Yes	275(77.5)
	No	80(22)



Table 3: Knowledge, behavioral and clinical characteristics of study participants attending diabetic follow-up clinic in HFSUH, Eastern Ethiopia, 2019

Characteristics (N=355)	Categories	n (%)
1. Type of diabetes	Type 1	69(19.4)
	Type 2	286(80.6)
2. Duration of DM	< 5 years	145((40.8)
	≥ 5 years	210(59.2)
3. Average 3 months FBS	<80 mg/dl	0(0)
	80-130mg/dl	96(27)
	>130mg/dl	259(73)
4. If uncontrolled, what was done?	Escalating/Deescalating dose	100(38.6)
	Adding another medication	14(5.4)
	Shifting to insulin	11(4.2)
	Advice for diet/exercise/adherence	27(10.4)
	No intervention	107(41.3)
5. If it was not intervened, reason	Patient refused	12(11.2)
	Physician not considered	95(88.8)
6. Type of DM treatment	Oralhypoglycemics	201(56.6)
	Insulin	119(33.5)
	Oralhypoglycemics & insulin	35(9.9)
7. Alcohol drinking	yes	27(7.6)
	No	328(92.4)
8. Ever attended DM education	Yes	237(66.8)
	No	118(33.2)
9. If yes, is it beneficial	Yes	233(98.3)
	No	4(1.7)
10. Knowledge of target FBS level	Yes	68(19.2)
	No	287(80.8)
11. Knowledge of signs & symptoms Of hyper/hypoglycemia	Yes	222(62.5)
	No	133(37.5)
12. Khat chewing	Yes	111(31.3)
	No	244(68.7)

Table 4: Multivariate analysis of factors associated with poor glycemic control among diabetic out-patients attending HFSUH, 2019

Variables (n=355)	poor glycemic control (%)	Adjusted OR (95% CI)	P Value
Residence			
Urban	193 (73.4)	3.62 (0.850-1.127)	0.06
Rural	66 (81.7)	1	
Educational status			
Illiterate	75(80.9)	9.57(1.87-14.94)	*0.001



Read & write	10(43.4)	2.61(0.64-9.89)	0.005
1-8	70(0.7)	1	
9-12	48(0.8)	1	
College & above	56(69.7)	1.86(0.74-5.83)	0.156
Duration of DM in year			
<5	102(70.3)	1	
>5	177(84.3)	6.911(0.742-1.118)	<0.001
Regular physical exercise			
>3 days (adequate)	167(71.5)	0.880 (0.906-1.254)	0.134
0-3 days (inadequate)	92(75.4)	1	
Type of treatment			
Oralhypoglycemics	165 (82.1)	3.104(2.087-11.231)	* 0.001
Insulin	71(59.7)	1	
Oralhypoglycemics & insulin	19(54.3)	1	
Type of diabetes			
Type 1	38(42.2)	1	
Type 2	241(84.3)	6.003(4.231-13.915)	* 0.001
Khat chewing			
Yes	88(79.3)	8.22(6.254-13.867)	* 0.003
No	112(45.9)	1	
Compliance to diet			
Yes	124(45.9)	1	
No	65(81.3)	4.83(7.831-11.562)	*<0.001
Adherence to medications			
Yes	228(71.02)	1	
No	31(91.1)	4.133(1.258-14.126)	*<0.001
Regular follow up			
Yes	231(71.7)	1	
No	28(84.8)	2.206(0.826-5.890)	0.002

*Statistically significant P value <0.05

Discussion

In this study more than two-third (73%) of diabetic patients had poor glycemic control. The result of this study was almost comparable with previous studies done in Dessie Referral Hospital 70.8% (Fiseha et al., 2018), Jimma University Teaching Hospital 70.9% (Kassahun et al., 2016) and Gadarif, Eastern Sudan 71.9% (Omar et al., 2018) but higher than, University of Gondar Referral Hospital 64.7% (Abebe et al., 2021) and lower than Tikur Anbessa Specialized Hospital, Addis Ababa 80% (Tekalegn et al., 2018), Mombi, India (91.8%) , Hohoe Municipal hospital, Ghana (86.4%) [Fiagbe J.et al., 2017], Saudi Arabia, in Al-madinah (76.4%) [Andrew J.M.et al., 2013], Mathari National and Referral Hospital Nairobi, Kenya (81.6%) (Nduati et al., 2016).

The difference in rates of glycemic control could be because of sample sizes, data collection methods, differences of studied population or method of determining glycemic control.

The higher rate of poor glycemic control seen among rural residents was similar with studies done in Jima University Teaching Hospital (Kassahun et al., 2016) , Dessie Referral Hospital (Fiseha et al., 2018) and Gonder University Hospital (Abebe et al., 2021). This could be due to lower awareness, poor access to health facilities, transportations and refrigerators to store medications for treatment and control of diabetes among rural residents. Level of education is also associated with poor glycemic control like other studies done in Dessie Referral Hospital (Fiseha et al., 2018), Limmu genet General Hospital (Bayisa and Bekele, 2017), and Ambo General Hospital (Tegegne et al., 2014). Poor glycemic control was higher among type 2 DM

patients, longer duration of DM, who were not practicing regular physical exercise, non-adherence to their medications, type of treatment, who had poor follow-up, noncompliance to diet and khat chewers which is consistent with most studies done in Ethiopia (Fiseha et al., 2018).

The lack of association between BMI, monthly income, attending DM education ,alcohol drinking occupation, gender, ethnicity, religion, age, SMBG, knowledge of signs and symptoms of hyper/hypoglycemia, marital status, knowledge of target FBS level were not consistent with some previous studies done in Ethiopia (Mamo et al., 2019). The poor glycemic control observed among patients receiving oral anti-diabetics was also supported by previous studies (Mullugeta et al., 2012) and (Ahmad et al., 2014). However, studies have shown that the use of insulin or a combination of insulin and oral ant diabetics are associated with poor glycemic control which is comparable with this study too (Yosef et al., 2021).

5. Conclusions and Recommendation

Most (73%) of adults attending our outpatient diabetic clinic in HFSUH, Eastern Ethiopia had poor glycemic control. Among 259(73%) patients with poor glycemic control 95(88.8%) were not intervened because physician(s) was (were) not considered could be because of knowledge gap. In this study the associated factors with poor glycemic control were educational status, duration diabetes, type of diabetes (type 2), type of treatment (oralhypoglycemics), area of residents (rural), compliance to diet, adherence to medications, regular physical exercise and khat chewing. More than two-thirds 88(79.3%) of khat chewers had poor glycemic control of which 68.4% had poor follow-up, 70.1%



were nonadherent to medications and 66.8% were noncompliance to diet which might explain the association.

These findings show the need for proper management of patients focusing on the identified associated factors for poor glycemic control should be the primary goal to maintain ideal level of glycemic control. These results showed that we need to strengthen our effort on optimum management of diabetes and associated factors, since good glycemic control is the main therapeutic goal for all patients with diabetes to prevent or decrease diabetic related complications.

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Contribution of Authors (authorship)

- MT: A principal investigator and was initiating and leading all activities of this research.
- GD : A major advisor and was providing valuable professional comments
- OT: Co-advisor and was providing valuable professional comments
- DA :Co-advisor and was providing valuable professional comments
- AS: Co- advisor and was providing valuable professional comments

References

1. ABEBE, S. M., DEMISSE, A. G., ALEMU, S., ABEBE, B. & MESFIN, N. (2021). Magnitude of metabolic syndrome in Gondar town, Northwest Ethiopia: A community-based cross-sectional study. *PLOS ONE*, 16, e0257306.
2. AHMAD, N. S., ISLAHUDIN, F. & PARADATHATHU, T. (2014). Factors associated with good glycemic control among patients with type 2 diabetes mellitus. *J Diabetes Investig*, 5, 563-9.
3. BAYISA, B. & BEKELE, M. (2017). Glycemic control and associated factors among type II diabetic patients on chronic follow up at Southwest Ethiopia. *J Med Health Sci*, 6, 13-20.
4. CRAIG, M. E., HATTERSLEY, A. & DONAGHUE, K. C. (2009). Definition, epidemiology and classification of diabetes in children and adolescents. *Pediatr Diabetes*, 10 Suppl 12, 3-12.
5. FISEHA, T., ALEMAYEHU, E., KASSAHUN, W., ADAMU, A. & GEBREWELD, A. (2018). Factors associated with glycemic control among diabetic adult out-patients in Northeast Ethiopia. *BMC research notes*, 11, 1-6.
6. GUARIGUATA, L., WHITING, D., WEIL, C. & UNWIN, N. (2011). The International Diabetes Federation diabetes atlas methodology for estimating global and national prevalence of diabetes in adults. *Diabetes Res Clin Pract*, 94, 322-32.
7. IDF 2015. *IDF Diabetes atlas 9th*. Brussels, 220, 13-17.
8. KASSAHUN, T., ESHETIE, T. & GESESEW, H. (2016). Factors associated with glycemic control among adult patients with type 2 diabetes mellitus: a cross-sectional survey in Ethiopia. *BMC Research Notes*, 9, 78.
9. MAMO, Y., BEKELE, F., NIGUSSIE, T. & ZEWUDIE, A. (2019). Determinants of poor glycemic control among adult patients with type 2 diabetes mellitus in Jimma University Medical Center, Jimma zone, south west Ethiopia: a case control study. *BMC Endocr Disord*, 19, 91.
10. MULLUGETA, Y., CHAWLA, R., KEBEDE, T. & WORKU, Y. (2012). Dyslipidemia associated with poor glycemic control in type 2 diabetes mellitus and the protective effect of metformin supplementation. *Indian journal of clinical biochemistry : IJCB*, 27, 363-369.
11. NATHAN, D. M., BUSE, J. B., DAVIDSON, M. B., FERRANNINI, E., HOLMAN, R. R., SHERWIN, R. & ZINMAN, B. (2009). Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes Care*, 32, 193-203.
12. NDUATI, N. J., SIMON, K., EVA, N. & LAWRENCE, M. (2016). Factors Associated with glycemic control among type 2 diabetes patients attending Mathari National Teaching Hospital, Nairobi Kenya. *J Endocrinol diabetes*, 3, 1-11.
13. OMAR, S. M., MUSA, I. R., OSMAN, O. E. & ADAM, I. (2018). Assessment of glycemic control in type 2 diabetes in the Eastern Sudan. *BMC research notes*, 11, 1-5.
14. TEGEGNE, G., SHIFERAW, A., KEFALE, B., DEFERSHA, A., WOLDU, M. & LIKISA, J. (2014). Glycemic Control and Self-Care Practice among Ambulatory Diabetic Patients in Ambo General Hospital, West Showa, Ethiopia. *Global Journal of Medical Research: B Pharma, Drug Discovery, Toxicology and Medicine*, 14.
15. TEKALEGN, Y., ADDISSIE, A., KEBEDE, T. & AYELE, W. (2018). Magnitude of glycemic control and its associated factors among patients with type 2 diabetes at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. *PLoS One*, 13, e0193442.
16. YOSEF, T., NUREYE, D. & TEKALIGN, E. (2021). Poor Glycemic Control and Its Contributing Factors Among Type 2 Diabetes Patients at Adama Hospital Medical College in East Ethiopia. *Diabetes Metab Syndr Obes*, 14, 3273-3280.