

Helen Yifter, Ahmed Reja, Abdurezak Ahmed, K.M. Venkat Narayan, Wondwossen Amogne. *Ethiop Med J*, 2020, Vol. 58, Supp. 2

## ORIGINAL ARTICLE

# ACHIEVEMENT OF DIABETES CARE GOALS AT TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA

Helen Yifter, MD<sup>1\*</sup>, Ahmed Reja, MD<sup>1</sup>, Abdurezak Ahmed, MD<sup>1</sup>, K.M. Venkat Narayan, MD, MSc, MBA<sup>2</sup>, Wondwossen Amogne, MD, PhD<sup>1</sup>

## ABSTRACT

**Introduction:** Diabetes mellitus is a major public health problem and responsible for premature death, and chronic disabling complications. Implementation of evidence-based interventions have resulted in improvement in achievement of diabetes care goals in several high-income countries. However, there is limited evidence for this in low-middle-income countries.

**Objective:** To assess achievement of diabetes care goals in people with diabetes at the Tikur Anbessa Hospital diabetes center in Ethiopia.

**Methods:** We conducted a cross-sectional hospital-based study (n=421) at Tikur Anbessa Specialized Hospital, in Addis Ababa. The study was done among ambulatory patients with type 2 diabetes and type 1 diabetes of more than five years duration. We used a structured questionnaire and data abstraction checklist to document demographic characteristics and diabetes-related information. We also conducted physical examination and laboratory tests.

**Results:** Overall, 421 study participants were included. The mean age was 52.7±13 years. Majority were females (55.6%). Sixty-one percent access health care service for free. Majority (81.5%) of the study participants were type 2. The mean duration of diabetes was 12.6±8.9 years. More than 50% of the study participants had diabetes for more than 10 years. 45% were on Insulin, 30% on metformin and 25% on combined oral agents.

The three treatment goals namely glycemic control, lipid profile and blood pressure control were achieved in 3.6% of patients. The percentage of patients with controlled Blood pressure is 75.2, and glycemic control was achieved in 39.8% of patients. Only 19.8% of patients had recorded lipid profile.

**Conclusion:** The achievement of diabetes care goals is lower as compared to other studies done in Ethiopia. The absence of standardized monitoring tool, inconsistent patient-doctor relationship and follow up by internal medicine residents with little supervision may have contributed for the lower rate of diabetes care goal achievement.

**Key words:** Diabetes, Diabetes care goals, achievement of Diabetes care goals, Tikur Anbessa hospital

## INTRODUCTION

Diabetes is a complex metabolic disorder characterized by chronic hyperglycemia. The number of diabetic population in every country is increasing. According to International Diabetes Federation (IDF), the number of individuals with diabetes has reached 415 million in 2015 and this number will rise to 642 million by the year 2040. Eighty percent of people with diabetes live in low- and middle-income countries. In sub-Saharan Africa the prevalence of diabetes is projected to increase by more than 100% in the coming 20 to 30 years. The International Diabetes Federation estimates 2.68 million people aged 20-79 years have diabetes in Ethiopia (1). This number is an underestimate as prevalence studies done in urban and sub urban Ethiopia report 5.4-6.5% (2,3). Non-communicable diseases and injury commission Ethiopia reported a diabetes prevalence of 3.2% based on the nationally conducted STEPS survey in 2018 (4).

Permanent disability is a common outcome of diabetes, with chronic complications of diabetes being major determinants of disability. About 50 to 80% of diabetic patients die of cardiovascular diseases. Many clinical trials have shown that the occurrence and progression of diabetes complications can be reduced significantly by achieving treatment targets for glycemia, blood pressure, serum cholesterol level and routine screening and treatment of diabetic eye disease, peripheral neuropathy, and diabetic kidney disease (5-8).

The care of patients with diabetes in developing and resource limited settings is challenged by the absence of locally adapted guidelines, implementation of available guidelines, shortage of trained human resource, continuity of health care services (health care services are geared towards delivery of primary health care and episodic illnesses), availability of medications and laboratory tests, and the

<sup>1</sup>Department of Internal Medicine, School of Medicine, Addis Ababa University.

<sup>2</sup>Rollins School of Public Health, Emory University.

\*Corresponding Author E-mail: helenefbr@gmail.com

lesser priority given to non-communicable diseases in general and diabetes in particular by policy makers and health care facility administrators. In order to improve quality of diabetes care, baseline data on the treatment and achievement of intermediate outcomes -fasting blood sugar (FBS), BP, lipid, weight, BMI, processes indicators (screening for neuropathy, retinopathy, nephropathy) and diabetes self-management education is important. Improved diabetes and other cardiovascular risk factor control along with preventive screening for chronic complications can significantly reduce diabetes related morbidity and mortality. In USA studies published documenting the progress in the achievement of diabetes care goals over the last more than 20 years have shown that there is significant improvement but still there are residual gaps to address with close to 50% of adults not achieving the recommended care goals (9).

The improvement in achievement of diabetes care goals also resulted in significant decline in the occurrence of chronic complications of diabetes in the last 20 years. There is limited evidence from developing countries on the progress of diabetes care. A meta-analysis of quality of diabetes care in sub Saharan Africa concluded that despite the significant increase in the prevalence of diabetes, there is limited access to diabetes diagnosis and diabetes care (10).

A study from Kenya (11) compared the diabetes care and glycemic control between a regional and tertiary referral hospital, and showed that there was no significant difference in achievement of good glycemic control (15% vs 17%). Gudina, et al. assessed the quality of diabetes care at Jimma University specialized hospital diabetes follow up clinic, and results showed that achievement of glycemic control was poor (73.1%) of patients with mean FBS >130 mg/dl, and other practice indicators were suboptimal (12).

Because of paucity of data on quality and progress of diabetes care in Ethiopia, we conducted the present study to look into the achievement of diabetes care goals at tertiary hospital in Addis Ababa, Ethiopia. The results of this study can also be used to plan quality improvement projects, improve diabetes care management and addressing priorities in diabetes care.

## PATIENTS AND METHODS

This is part of a major study looking at ‘the achievements of diabetes care goals and prevalence of chronic complications at Tikur Anbessa specialized hospital’ which was conducted as a requirement for completion of a Medical Education Partnership Initiative (MEPI) Scholars program in 2018. This paper specifically addresses the objectives related to the achievements of diabetes care goals.

We conducted a cross-sectional hospital-based study at Tikur Anbessa Specialized Hospital, in Addis Ababa. The hospital has a bed capacity of 800 and more than 500,000 patients are treated as outpatient and inpatient every year. The Diabetes center is run by Endocrinologists, Fellows, Internal Medicine residents and Nurses. It provides comprehensive diabetes care to around 800 to 1000 diabetic outpatients a month. Patients are seen mainly seen by Internal Medicine residents who work based on rotation schedule. Consultant Endocrinologists are assigned each day of the week to supervise and mentor residents and Fellows. There are no formally trained diabetes educators, foot care specialists or dietitians. It runs two days per week diabetes clinic, one day pregnancy and diabetes clinic, one-day foot clinic, diabetic retinopathy screening every day and laser treatment twice per week.

The study was carried out among ambulatory clients with Type 2 diabetes and type 1 diabetes of more than five years duration. Patients with type 1 diabetes for more than five years and pregnant mothers were excluded from the study.

### *Sampling, recruitment and data collection*

Clients who met the inclusion criteria and provided written consent were sampled by recruiting consecutive clients. Data collection was done between April and August 2018.

Structured questionnaires and data abstraction check lists were administered by three study investigators assisted by two trained nurses, to capture data on socio-demographic characteristics, duration and type of diabetes, comorbidities and complications, whether they had tests to screen for diabetes complications (dilated eye examination, foot examination, urine analysis, dental exam), glycated hemoglobin (HbA1c), frequency of visit, blood glucose checkups, and whether they have checkups in other health facilities. The study investigators also did physical exam to measure waist circumference, hip circumference, detect loss of protective sensation using a 10g-monofilament and tuning fork, and an ankle brachial index (ABI). Retinal screening for retinopathy was done using a digital camera by trained nurses. Laboratory tests for FBS (day of visit), hemoglobin A1c, lipid profile, urine analysis results in the last one year were recorded from patient charts.

### *Definition of treatment goals*

The treatment goal for diabetes control is defined as HbA1c  $\leq 7.0\%$  or FBS of  $<130\text{mg/dl}$ , according to the IDF treatment guideline<sup>13</sup>. Following the recommendations of the Eight Joint National Committee (JNC 8) (14), the blood pressure goal for patients with diabetes is defined as  $<140/80\text{mmHg}$ . The total Cholesterol treatment goals is  $<200\text{mg/dL}$ .

### ***Ethical considerations***

Ethical approval was received from the Institutional review board of College of Health Sciences, Addis Ababa University. Permission to collect data was obtained from the Outpatient directorate director and head of the Diabetes center.

### ***Statistical analysis***

Data was collected by trained data collectors. On spot supervision was done to improve the quality of the data. The collected data was entered using SPSS version 23, exported to STATA version 13 SE (StataCorp, 4905 Lakeway Dr College Station, TX 77845). Data was cleaned, categorized and recoded to meet for the current analysis. Descriptive analysis was done using frequency tables, crosstabs, mean, median, mode, and proportions were done.

Further to identify factors associated with the chronic complication of diabetes and achievement of diabetic care chi square, bivariate logistic regression and multivariate logistic regression were employed. All statistical tests were performed at 95 % confidence level and statistical significance considered at p value of less or equal to 0.05.

## **RESULTS**

### ***Socio-demographic characteristics***

Overall, 421 study participants were included for the purpose of this study. The mean (SD) age of the study participants was 52.7 ( $\pm$ 13.9) years). Majority were females (55.6%). Among the study participants, 39% of them attended secondary school and 28% tertiary school. Sixty-one percent of the study participants access health service for free. Self-employed were the majority followed by housewife.

### ***Diabetes mellitus characteristics***

Majority (81.5%) of the study participants had type 2 DM. The mean duration of diabetes was 12.6 years. More than 50% of the study participants had diabetes for more than 10 years. 61% of them had no family history of diabetes. A larger proportion of the respondents were on Insulin 45%, followed by metformin 30% and combined oral agents. Hypertension was the most common reported co-morbidities with 54.5%.

### ***Achievement of Diabetes care goals***

Diabetes care goals achievement was assessed based on three factors (FBS, dyslipidemia and blood pressure). Good glycemic control was achieved in 26.1% of patients. 75.2% of patients had well controlled blood pressure. A recorded Lipid profile in the last one year was found in 19.8% of patients, out of which 39.8% had total cholesterol less than 200 mg/dl. 3.6% of patients achieved the three diabetes care goals.

**Table 1:** Table 1 Socio-demographic characteristics of study participants (n=421)

<b>Variable</b>	<b>n (%)</b>
Age (years)	
18-34	49 (11.6%)
35-64	307 (72.9%)
>65	65 (15.4%)
Sex	
Male	187 (44.4)
Female	234 (55.6)
Religion	
Orthodox	327 (77.7)
Muslim	41 (9.7)
Catholic	43 (10.2)
Protestant	2 (0.5)
Other	8 (1.9)
Education	
No formal education	44 (10.5)
Primary education	92 (21.9)
Secondary education	167 (39.8)
Tertiary education	117 (27.8)
Access to health care	
Free	257 (61.3)
Paying	162 (38.7)
DM type	
Type 2 DM	343 (81.5)
Type 1 DM	78 (18.5)
Duration of DM (years)	
<10	171 (45.1)
$\geq$ 10	208 (54.9)
Family History of DM	
No	257 (61.9)
Yes	158 (38.1)
Treatment being taken currently	
Insulin	186 (44.9)
Metformin	127 (30.6)
Glibenclamide	41 (9.88)
Glibenclamide+ Metformin	62 (14.9)
Insulin + Metformin	59 (14.2)
Hypertension	
Yes	228 (54.5)
No	190 (45.5)
Antihypertensive drugs	
ACE inhibitor	123 (43.6)
Calcium channel blocker	56 (19.9)
Diuretics	28 (9.9)
Combination	52 (18.4)
Not taking	71 (25.4)
Statin	223 (54)
ASA	181 (44.7)

### Factors associated with diabetes care goals achievement

#### Glycemic control

Demographic variables such as Sex, Educational status and type of diabetes were found to have statistical association with glycemic control. Accordingly, being male was associated with higher odds of having a good glycemic control compared to females with COR 1.7 (95% CI, 1.12, 2.71). Those patients with primary education were 2.9 times more likely to have a good glycemic control compared to those with no education. Patients with Type I diabetes were 1.8 times more likely to achieve glycemic control COR= 1.8 (1.16,3.39).

#### Blood pressure control

Those patients with diabetes type 1 were 3.2 times more likely to control their blood pressure well compared to those with type 2 DM COR= 3.2 (1.36,7.59).

#### Dyslipidemia

The number of patients with recorded lipid profile result was small (19.8% of study participants). There was no significant association between most of the variables including age, gender, duration of diabetes or access to health care and status of lipid control

**Table 2:** Achievement of diabetes care goals among study participants attending outpatient department in Tikur Anbessa Hospital

Variables	N(%)
Fasting blood glucose	
Poor control	270 (64.1)
Good control	110 (26.1)
No record	41 (9.7)
Lipids	
Poor control	50 (60.2)
Good control	33 (39.8)
No record	338 (80.2%)
Blood pressure	
Well controlled (<140/80)	303 (75.2)
Poorly controlled (>140/80)	100 (24.8)
No record	18 (4.2)
Composite index of diabetic goal achievements	
Partial achieved	237 (93.7)
Fully achieved	9 (3.6)
Not achieved	7 (2.8)

**Table 3:** Factors associated with glycemic control among study participants attending outpatient department in Tikur Anbessa Hospital

Variable	Good control	Poor control	COR
Age(years)			
18-34	15(3.9)	30(7.9)	Ref
35-64	65(17.1)	196(51.6)	0.66(0.33,1.31)
≥65	30(7.9)	44(11.6)	1.36(0.63,2.96)
Sex			
Male	59(15.5)	108(28.4)	1.74(1.12,2.71)*
Female	51(13.4)	162(42.6)	Ref
Educational status			
No formal education	6(1.6)	33(8.7)	Ref
Primary School	27(7.1)	51(13.5)	2.91(1.1,7.81)*
Secondary school	45(11.8)	111(29.3)	2.23(0.87,5.69)
Tertiary school	31(8.2)	75(19.8)	2.7(0.86,5.97)
Monthly Income (ETB)			
<500	11(3)	32(8.7)	Ref
500-1499	39(10.6)	71(19.4)	1.59(0.73,3.51)
1500-4999	46(12.5)	121(32.9)	1.12(0.51,2.37)
>5000	10(2.7)	37(10.1)	0.79(0.29,2.1)
Access to health care			
Free	71(18.7)	159(41.9)	ref
Playing	39(10.3)	110(29)	0.79(0.5,1.26)
Duration of diabetes (years)			
≤10	44(11.6)	127(33.5)	Ref
>10	65(17.2)	143(37.7)	1.31(0.83,2.06)
Type of DM			
Type 1	29(7.7)	41(10.9)	1.8(1.16,3.39)*
Type 2	81(21.4)	227(60.1)	Ref

## DISCUSSION

This is part of a major study looking at ‘the achievements of diabetes care goals and prevalence of chronic complications at Tikur Anbessa Specialized Hospital, which was conducted as a requirement for completion of a Medical Education Partnership Initiative (MEPI) Scholars program in 2018. This paper specifically addresses the objectives related to the achievements of diabetes care goals. Accordingly, we have assessed three major diabetes care goal achievement indicators, namely glycemic control, blood pressure control and lipid profile. We have included 421 subjects for this study. There is no peculiar demographic factor identified pertinent to achieving diabetes care goals, and our demographic findings are not different from studies done in similar settings (15).

This discussion focuses on three major findings of the study. Overall, we have found out that 3.6% of patients achieved the three diabetes care goals. Specifically, the percentage of patients with controlled Blood pressure was found to be 75.2%. Glycemic control was good in 39.8% of patients and out of the 19.8% of patients with recorded lipid profile 39.8% had good lipid profile in the year preceding the study. Each finding is discussed in more detail below.

The overall achievement of diabetes care goals (3.6%) is lower than another study done in Ethiopia. We were only able to identify one study done at Ayder Hospital in Northern Ethiopia which reported 8.5% of patients achieving the three treatment goals (15). Even though, there are studies reporting on glycemic control, there is a paucity of data looking at the percentage of combined diabetes care goals in sub Saharan Africa.

We used FBS to classify glycemic control as good (90-130mg/dl) or poor (>130 mg/dl). We chose to use this measure, since HbA1c is not readily available at public hospitals. Based on these criteria, 39.8% of patients achieved good glycemic control. In line with our finding, similar rate of good glycemic control was reported from Tanzania (30.3%) (16). The lower rate of glycemic control in our study could be a result of multiple factors.

The percentage of patients with good blood pressure control, 75.2%, is higher than studies done elsewhere (15,17,18). What explains the consistently good blood pressure control among diabetic patients in our setup needs further exploration. The finding that 39.8% of patients have good total cholesterol is very difficult to interpret as only 19.8% of patients have a record of lipid profile in the preceding year.

This may be as a result of lack of consistent supply of statins, lack of laboratory test for lipid profile in the hospital and reluctance of physicians to order lipid profile test during patient visit. This also needs further exploration.

Despite the evidence that vascular risk factor control reducing complications, attaining concurrent control of glycemia, blood pressure, and LDL-C in patients with T2DM has been challenging with slow progress in the USA (19,20). Data from a multicenter study in Asia which also included Greece revealed that approximately 10% or less of patients achieved triple vascular disease control (921). Similarly, a study in China reported only 5.6% achieved all target goals (22). These studies indicate that achieving diabetes triple goals remains a global challenge.

In light of the global trend described above, our finding of 3.6% conforms to the trend. The still lower rate may be due to the lack of continuity of care provided at our center. Our center is organized to deliver care by rotating Internal Medicine residents or Endocrinology fellows with minimal oversight from Endocrinologists. This not only results in poor follow up but also effectively deprive patients from the one to one relationship with the care giver which is essential for good outcome in chronic care. This in general indicates that a lot needs to be done to address this huge gap in achieving the triple treatment goals of diabetes care worldwide. This calls for increased attention and resource to implement a multicomponent quality improvement intervention (23).

In clinics where care is mainly provided by Internal medicine residents, there is an added challenge of continuity of care. There are several factors to explain this, Residents and faculty physicians see patients only for few hours per week. This results in difficulty to understand how to use the clinic resources to optimize care and build interprofessional team (24).

### **Conclusion**

The achievement of diabetes care goals is lower as compared to International standards and other studies done in Ethiopia. The absence of standardized monitoring tool, inconsistent patient-doctor relationship and follow up by internal medicine residents with little supervision may have contributed for the lower rate of diabetes care goal achievement. Further studies looking at the process of diabetes care and quality improvement projects are recommended.

## REFERENCES

1. International Diabetes Federation. IDF Diabetes Atlas, 7th edn. Brussels, Belgium
2. Nshisso LD. Diabetes & Metabolic Syndrome: Clinical Research & Reviews 2012;6:36–41
3. Abebe AM, Berhane Y, Worku A, Assefa A. Diabetes mellitus in North West Ethiopia: a community based study. BMC Public Health 2014, 14:97 <http://www.biomedcentral.com/1471-2458/14/97>.
4. Eagan, Arielle. (2018). Ethiopia NCDI Poverty Commission: Commission Summary Report.
5. Patel A, MacMahon S, Chalmers J, Neal B, Billot L, Woodward M, et al. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. N Engl J Med 2008;358(24):2560–72.
6. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE sub-study. Heart Outcomes Prevention Evaluation Study Investigators. Lancet 2000;355(9200):253–9.
7. UKPDS 38. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: . BMJ 1998;317(7160):703–13.
8. Collins R, Armitage J, Parish S, Sleight P, Peto R. MRC/BHF Heart Protection Study of cholesterol-lowering with simvastatin in 5963 people with diabetes: a randomised placebo-controlled trial. Lancet 2003;361(9374):2005–16.
9. Mohammed K. Ali, Kai McKeever Bullard, Jinan B. Saaddine et al. Achievement of Goals in U.S Diabetes Care, 1999–2010. N Engl J Med 2013;368:1613-24. DOI: 10.1056/NEJMs1213829.
10. Jennifer Manne-Goechler, Rifat Atun, Andrew Stokes et al. Diabetes diagnosis and care in sub-Saharan Africa: pooled analysis of individual data from 12 countries Lancet Diabetes Endocrinol 2016; 4: 903–12.
11. Mwavua SM, Ndungu EK, Mutai KK. et al. A comparative study of the quality of care and glycemic control among ambulatory type 2 diabetes mellitus clients, at a Tertiary Referral Hospital and a Regional Hospital in Central Kenya. BMC Res Notes 2016;9:12.
12. Gudina EK, Tamiru S, Alemseged F, Ram R. Assessment of quality of care given to diabetic patients at Jimma University Specialized Hospital diabetes follow-up clinic, Jimma, Ethiopia BMC Endocrine Disorders 2011, 11:19.
13. IDF Clinical Practice Recommendations for managing Type 2 Diabetes in Primary Care - 2017.
14. JNC 8 Guidelines for the Management of Hypertension in Adults. Am Family Physician. 2014 Oct 1;90(7):503-504.
15. Belay E, Abera A, Mehari A, Endris K. Achievement of Diabetes goals and their determinants in Type 2 Diabetic patients attending outpatient diabetic clinic in Northern Ethiopia. International journal of Chronic Diseases Volume 2017, Article ID 571318.
16. Kamuhabwa R, Charles E, Predictors of poor glycemic control in type 2 diabetic patients attending public hospitals in Dar es Salaam. Journal of Drug, Healthcare and Patient Safety 2014;6:155–165.
17. Elis A, Rosenmann L, Chodick G, Heymann AD, Kokia E, Shalev V. The association between glycemic, lipids and blood pressure control among Israeli diabetic patients,” QJM: Intern J Med 2008;101(4):275–280.
18. Pinchevsky Y, Shukla V, Butkow N, Raal FJ, Chirwa T. The achievement of glycaemic, blood pressure and LDL cholesterol targets in patients with type 2 diabetes attending a South African tertiary hospital outpatient clinic,” Journal of Endocrinology, Metabolism and Diabetes of South Africa 2015;20(2):81–86, 2015.
19. Saaddine J, Cadwell B, Gregg E, Narayan K MV. Improvements in Diabetes Processes of Care and Intermediate Outcomes: United States, 1988–2002. Ann Intern Med. 2006;144:465-474.
20. Ryder JR, Gaesser GA, Shaibi GO. Achievement of Goals in U.S. Diabetes Care, 1999–2010. N Engl J Med 2013;368:1613-24.
21. Goh CC, Koh KH, Goh SCP, et al. Achieving triple treatment goals in multi-ethnic Asian patients with type 2 diabetes mellitus in primary care. Malays Fam Physician. 2018;13(2):10–18
22. Ji L, Hu D, Pan C, et al. Primacy of the 3B approach to control risk factors for cardiovascular disease in type 2 diabetes patients. Am J Med 2013 Oct;126(10):925.e11–22.
23. Ali MK, Singh K, Kondal D, Tandon N. Effectiveness of a Multicomponent Quality Improvement Strategy to Improve Achievement of Diabetes Care Goals: A Randomized, Controlled Trial. Ann Intern Med. Doi:10.7326/M15-2807.
24. Lynn L, Hess BJ, Weng W, Lipner Rs, Holmboe ES. Gaps In Quality Of Diabetes Care In Internal Medicine Residency Clinics Suggest the Need for Better Ambulatory Care. Training Health Affairs 2013;31(1):150-158 doi: 10.1377/hlthaff.2011.0907.