

# Adherence to diabetes self-care management and associated factors among people with diabetes in Gamo Gofa Zone public health hospitals

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## Abstract

**Introduction:** Adherence to diabetes self-care management is a lifestyle modification for people with diabetes which includes; medication, dietary practice and regular physical activity. The objective of this study was to assess the adherence to diabetes self-care management and associated factors among people with diabetes in Gamo Gofa Zone, Southern, Ethiopia, 2018.

**Methods:** Institutional-based cross-sectional study design with a systematic random sampling technique was conducted. A total 635 diabetic participants were involved in this study. Data were collected using structured interviewer administered questionnaire. Data were analyzed using SPSS version 21. Descriptive statistics were employed to describe the study population in relation to the relevant variables. Binary and multivariable logistic regression was conducted to identify factors associated with the outcome variables. *P*-value < 0.05 with 95% confidence interval was used to declare statistical significance.

**Results:** The prevalence of good adherence toward diabetes self-care management was 341 (53.7%), (95% confidence interval = 46.09, 61.31). Regarding diabetes self-care practices, poor adherence had been detected in blood sugar measurement practice, dietary feeding practice, physical exercise and eye examination practice. The multivariable analysis indicated that government workers [adjusted odds ratio = 2.74 (1.03, 7.30)], training on diabetes self-care practice [adjusted odds ratio = 3.13 (1.89, 5.16)], diabetes' association membership [adjusted odds ratio = 1.59 (1.01, 2.50)], having personal glucometer at home [adjusted odds ratio = 2.70 (1.37, 5.33)], duration of diabetic illness > 10 years [adjusted odds ratio = 9.59 (3.99, 23.05)] and people with diabetes who were not developing complication [adjusted odds ratio = 1.54 (1.01, 2.33)] were significantly associated with good adherence to diabetes self-care management practice.

**Conclusion:** Significant number of diabetes patients had poor adherence to diabetes self-care practice. Special focus should be given to farmers with diabetes, those with diabetic complication and for those with duration of diabetes less than 10 years. Periodical training should be given for people with diabetes on dietary feeding, physical exercise and eye examination practice.

## Keywords

Diabetes mellitus, adherence to diabetes, self-care management, Gamo Gofa Zone

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## Introduction

Diabetes mellitus (DM) is one of the none communicable diseases comprises a group of common metabolic disorder that share the phenotype of hyperglycemia.<sup>1</sup> Adherence to diabetes self-care management is the practice of patients toward proper taking of medication, following a recommended diet, regular physical activity and foot care practice.<sup>2</sup> For this study, the level of adherence self-care management practice of diabetes with  $\geq 75\%$  of the total score was considered as

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good adherent; those who score  $\geq 50$  were considered adherent and those who scored  $\leq 49$  were considered as non-adherent.<sup>3-5</sup> Regarding to the glycemic control, those with a fasting blood sugar (FBS) value of 70–126 mg/dL were considered as adequate for DM control. That means the lifestyle of diabetes patients depends on the patients' adherence with self-care management practices.<sup>4</sup> As patients fail to monitor diabetes, it increases the risk of acute and chronic disease complications. To overcome these problems, self-care management practice is recommended.<sup>6,7</sup>

Recent studies conducted in different settings revealed that, the prevalence of adherence rate for diabetes medication uptake varied between 36% and 93%.<sup>8</sup> Health professionals face problem in providing quality care to patients due to malpractice on diabetes self-care management, a situation where diabetes patients visit clinics regularly and their blood glucose levels still remain high.<sup>9</sup>

Study conducted at Tikur Anbessa Specialized Hospital<sup>10</sup> indicated that majority of the patients had poor adherence to self-care management, especially in diet management practices. During the study period (2018), in Gamo Gofa Zone public health hospitals, Ethiopia, the prevalence of DM was increased from time to time which needs immediate public health interventions by assessing their levels of diabetes self-care management practices. Therefore, this study was conducted to provide detailed and concrete data for policymakers and stockholders to minimize the health and socio-economic burden associated with diabetes in the community and the nation at large.

## Methods

### Study setting

Institutional-based quantitative cross-sectional study was conducted from 1 February to 15 June 2018. From a total of six public health hospitals in the Zone, three hospitals, that is, Arba Minch, Chenchu and Sawulla Hospitals were selected randomly in Gamo Gofa administrative Zone. These hospitals has been giving preventive, curative and rehabilitative service for the catchment population including diabetes and other chronic non-communicable diseases. Gamo Gofa Zone is located in the Southern Nations, Nationalities, and People's Regional State, Ethiopia. This Zone is located 505 km south of Addis Ababa, the capital city of Ethiopia.<sup>11</sup>

### Study population

The study was conducted among type I and II diabetes patients who have been in chronic disease, from outpatient department follow-up for at least 3 months. People with diabetes with the age range of 15 years and above, attending the diabetes clinic during the study period were included in the study while those who were severely sick and those newly diagnosed with diabetes (less than 1 month), patients with

psychiatric problems and cognitive impairment were excluded from the study.

### Sample size determination

Sample size was determined using single population proportion formula by taking the prevalence of adherence to diabetes self-care management practice, 55.6% in Tikur Anbessa Specialized Hospital, Ethiopia,<sup>10</sup> and margin of error ( $d$ ) 4%, with 95% confidence level (CI).

$$n = \frac{\left(\frac{Z_{\alpha}}{2}\right)^2 P(1-P)}{d^2} = 593$$

By adding 10% non-response rate, the final sample size ( $n$ ) was estimated to be 652.

### Sampling methods

Systematic random sampling method was employed to select the study participants. The total sample size was distributed to the three public hospitals proportionally. Exit interviews of the participants were conducted during the follow-up time in private rooms.

### Data collection tools and procedures

Data collection was conducted using structured questionnaires. Socio-economic and demographic factors, diabetes education, patient provider communication, patients' self-care management training, behavioral-related factors and diabetes self-care activity measurements were assessed. Anthropometric measurements, blood pressure and fasting glucose level measurement were assessed using structured questionnaires. In addition, diabetes-related complication review chart extraction was conducted. The data were collected by interviewing patients during follow-up periods in the respective hospitals using structured questionnaires. Clinical-related diabetes complication was collected by reviewing charts.

Blood pressure and fasting glucose level were measured using calibrated instrument and following standard techniques. Three diploma nurses were recruited as a data collector and supervised by three master public health professionals. Adherence to diabetes self-care management was measured by summarizing the five items which include: dietary practice, exercise, blood glucose testing, foot care practice and smoking status.<sup>10</sup> The total score of each item of the questionnaire was calculated out of 100. The level of adherence self-care management to diabetes with a total score of  $\geq 75$  out of 100 was considered as good adherent while those who score  $\leq 49$  were considered as non-adherent. Adequate glycemic control for DM was considered when FBS measurement was between 70 and 126 mg/dL.<sup>4</sup>

## Study variables

Adherence to diabetes self-care management was the dependent variable while socio-demographic characteristics, dietary feeding practice, physical exercise, eye examination practice and foot care practices were some of the independent study variables as indicated in the result section.

## Data quality management

First, the questionnaire were prepared in English and translated to Amharic (the country's national language) for easy understanding. Then, it was re-translated back to English for analysis.

Pre-test was conducted in Jinka Hospital by taking 5% of the sample size before the actual data collection. Then, correction and modification was done based on the gap identified during the pre-test finding. Three-day training was given for the data collectors and supervisors on the aim of the study, content of the questionnaire, and the ways of interview. The principal investigator and supervisors made day-to-day onsite supervision during the whole period of data collection. The collected data were reviewed and checked for completeness, accuracy and consistency by supervisors and investigators.

## Data management and analysis

Data were coded and entered into Epi Info 7 and exported to SPSS version 21 for analysis. A descriptive frequency was calculated to describe the study population in relation to relevant variables. Exploratory data analysis was done to check, potential outliers and the normality distribution for those continuous variables. Wealth index was computed as a composite indicator of living standard using the principal component analysis (PCA). Binary logistic regression analysis was computed to assess the crude association between dependent and independent variables.

To identify significant factors associated with the outcome variables, significant study variables in binary logistic regression analysis with a  $p$ -value of less than 0.3 were included in the multivariate logistic regression model. Finally, significant factors were identified based on the values of adjusted odds ratio (AOR) at 95% CI and  $p$ -value less than 0.05.

## Results

### Socio-demographic characteristics

From a total of 652 participants, 635 were involved in this study making a response rate of 97.4%. Of the respondents, 319 (50.52%) were males and 316 (49.48%) were females. The mean age of the participants were  $48.47 \pm 13.86$  standard deviation (SD) years. More than half, 374 (58.9%) of the participants were above 45 years of old. Majority, 532 (83.8%) of them were married. Among the study participants, almost half of them, 312 (49.10%) have no formal education. The detailed

socio-demographic characteristics of the participants were indicated in Table 1.

### Blood glucose measurement practice of the participants

Almost half, 323 (49.9%) of the participants were aware of their blood glucose level. Regarding the insulin or oral hypoglycemic agent treatment intensity medication of the participants, 583 (91.8%) taken medication daily while the rest, 52 (8.2%) taken irregularly. The prevalence of diabetes patient glucose measurement practice adherence was 534 (84%) every month while 67 (10.6%) of them were in every week. Only 77 (11.9%) of the participants had private glucometer for glucose level measurement at household level. Among the participants, 128 (20.2%) diabetes patients had fasting glucose level in normal range (76–126 mm/dL); whereas, 464 (73.1%) had above 126 mm/dL and 21 (3.3%) had below 76 mm/dL (Table 2).

### Prevalence of adherence to diabetes self-care management practice

The prevalence of good adherence to diabetes self-care management was 341 (53.7%) with (95% CI=46.09, 61.31) and the rest, 294 (46.3%) had poor adherence (Figure 1). Among the participants', majority, 627 (98.8%) of them showed relatively good adherence in blood pressure measurement, regular diabetes follow-up in the hospitals, 621 (97.8%) and medication intake based on health profession prescription, 592 (93.1%) (Table 2). But poor adherence was detected in regular blood sugar measurement, dietary feeding practice, physical exercise and eye examination practice.

### Factors associated with diabetes self-care practice

In binary logistic analysis, factors like government worker (crude odds ratio [COR]=1.54 (1.12, 2.13)), having diabetes self-care management practice awareness [COR=1.92 (1.35, 2.74)], training on diabetes self-care [COR=2.24 (1.63, 3.10)], type II diabetes patients [COR=1.47 (1.05, 2.07)], diabetes association membership [COR=2.71 (1.88, 3.91)], having private glucometer at home [COR=3.27 (1.86, 5.76)], duration of diabetes illness  $\geq 10$  years COR [3.48 (1.59, 7.63)], people with diabetes who were not develop complication [COR 1.61 (1.16, 2.22)] were associated with good adherence to diabetes self-care management practice. Significant variables in binary logistic regression with a  $p$ -value of  $<0.3$  were candidate to multivariable analysis. Finally, multivariable analysis indicated that government worker [AOR=2.74 (1.03, 7.30)], training on diabetes self-care [AOR=3.13 (1.89, 5.16)], diabetes association membership [AOR=1.59 (1.01, 2.50)], having private glucometer at home [AOR=2.70 (1.37, 5.33)], duration of diabetes illness  $\geq 10$  years [AOR=9.59

**Table 1.** Socio demographic characteristics of diabetes patients in Gamo Gofa Zone Public Health facility, 2018.

Variables	Adherence on self-care	
	Adhere to diabetes self-care management practice	None adhere to diabetes self-care management practice
<b>Sex</b>		
Male	183 (53.7%)	136 (46.3%)
Female	158 (46.3%)	158 (53.7%)
<b>Age</b>		
<25 years	19 (5.6%)	14 (4.8%)
26–45 years	126 (37.0%)	102 (34.7%)
>45 years	196 (57.5%)	178 (60.5%)
<b>Address</b>		
Rural	96 (28.2%)	100 (34.0%)
Urban	245 (71.8%)	194 (66.0%)
<b>Distance</b>		
≤5 km	179 (52.5%)	153 (52.0%)
≥6 km	162 (47.5%)	141 (48.0%)
<b>Educational status</b>		
No formal	158 (46.3%)	154 (52.4%)
Primary	47 (13.8%)	33 (11.2%)
Secondary and above	136 (39.9%)	107 (36.4%)
<b>Occupational status</b>		
Government workers	199 (58.4%)	141 (48.0%)
Merchant	13 (3.8%)	12 (4.1%)
Farmers	129 (37.8%)	141 (48.0%)
<b>Wealth index</b>		
Poor	131 (38.4%)	123 (41.8%)
Medium	65 (19.1%)	40 (13.6%)
Rich	145 (42.5%)	131 (44.6%)

(3.99, 23.05)] and people with diabetes who were not develop complication [AOR=1.54 (1.01, 2.33)] were identified significant factors associated with good adherence to diabetes self-care management practice (Table 3).

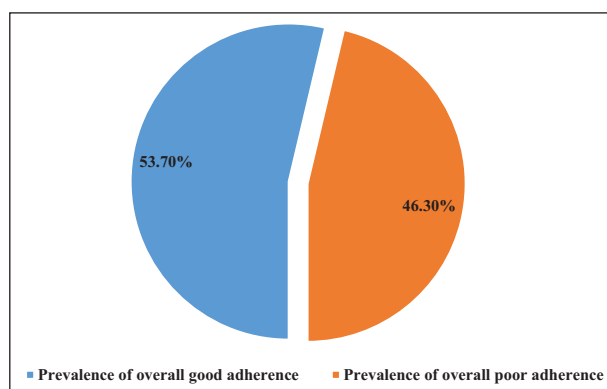
## Discussion

The prevalence of good adherence toward diabetes self-care management in this study was in line with study conducted in Ethiopia, Addis Ababa<sup>10</sup> and Nekemte (55%),<sup>5</sup> but higher than in Harari town, Ethiopia (39%) and Bahir Dar, Ethiopia (36%).<sup>12</sup> This study was lower than study done in Dilla, Ethiopia (76.8%), Iran (74%) and Finland (81%).<sup>2,13</sup> This might be due to financial barriers, lack of awareness on the importance of the practices, socio-cultural variation and life-style difference.

In this study, the dietary adherence was 34.9% which was lower than study conducted in Dilla (49.7%),<sup>2</sup> Addis Ababa Tikur Anbessa Specialized Hospital (78%) and in Harari town 57.5%.<sup>9,14</sup> This variation may be due to measurement variation or patient's poor perception toward fruits and vegetables or patient difficulty to differentiate the recommended diet.

**Table 2.** Self-care management practice toward diabetics, in three public health hospital in Gamo Gofa Zone, 2018.

Self-care practice component	Category	Frequency
Glucose measurement practice	Every week	67 (10.60%)
	Every month	534 (84.00%)
	Above 1 month	34 (5.40%)
Medication intake	Daily	592 (93.10%)
	Irregularly	53 (8.30%)
Blood pressure measurement habit	Frequently 2–3/week	627 (98.80%)
	Not measured frequently	8 (1.20%)
Diabetics care follow-up habit	Follow every month	621 (97.80%)
	Not follows every month	14 (2.20%)

**Figure 1.** Prevalence of adherence to diabetes self-care management practice, in three public health hospitals in Gamo Gofa Zone, 2018.

Adherence to regular physical exercise was 34.5% which was similar to study in Eastern Ethiopia, Harari town (31%),<sup>15</sup> but lower than in Pakistan (66%) and Felege Hiwot Hospital, Ethiopia.<sup>13,16</sup> This variation might be due to the failure of physicians to explain the importance of exercise in diabetes care and lack of facility for physical exercise. Daily foot examination practice was 54.3% among the participants which was similar to the study conducted in Qatar (52.3%). This study revealed that weekly regular monitoring of blood glucose practice was 10.6% which was lower than study conducted in Felege Hiwot Hospital, Northwest Ethiopia (23.6%).<sup>12</sup>

In this study, there was a poor blood glucose level monitoring practice among the participants, which was in between weeks to a month interval. This poor glucose control might be resulted due to the lack of private glucometer as majority of them have no private glucometer. Diabetes patients who work as government worker had 2.74 (1.03, 7.30) times more likely to adhere diabetics self-care management as compared to farmers. This was in line with a study conducted in Iran.<sup>13</sup> This might be due to the fact that government workers are relatively more educated so that they understood the benefit of diabetes

**Table 3.** Factors associated with adherence to diabetes self-care management practice, in three public health hospitals in Gamo Gofa Zone, 2018.

Variable	Adherence to diabetes self-care practice		COR (95% CI)	AOR (95% CI)	p-value
	Adhere	None adhere			
<b>Sex</b>					
Male	183 (53.7%)	136 (46.3%)			0.16
Female	158 (46.3%)	158 (53.7%)	0.74 (0.54, 1.02)	0.75 (0.49, 1.13)	
<b>Address</b>					
Rural	96 (28.2%)	100 (34.0%)			0.18
Urban	245 (71.8%)	194 (66.0%)	1.32 (0.94, 1.84)	1.41 (0.85, 2.33)	
<b>Educational status</b>					
No formal education	158 (46.3%)	154 (52.4%)			0.31
Primary education	47 (13.8%)	33 (11.2%)	0.72 (0.44, 1.18)	1.29 (0.78, 2.15)	
Secondary and above	136 (39.9%)	107 (36.4%)	0.81 (0.58, 1.13)	0.66 (0.33, 1.32)	
<b>Occupation</b>					
Government workers	199 (58.4%)	141 (48.0%)	1.54 (1.12, 2.13)	2.74* (1.03, 7.30)	0.02
Merchant	13 (3.8%)	12 (4.1%)	1.30 (0.58, 2.94)	1.75 (0.07, 2.88)	
Farmers	129 (37.8%)	141 (48.0%)			
<b>Wealth index</b>					
Poor	131 (38.4%)	123 (41.8%)			0.62
Medium	65 (19.1%)	40 (13.6%)	1.04 (0.74, 1.46)	0.88 (0.53, 1.46)	
Rich	145 (42.5%)	131 (44.6%)	0.68 (0.43, 1.08)	0.72 (0.41, 1.28)	
<b>Training on DM self-care</b>					
Yes	232 (68.0%)	143 (48.6%)	2.24 (1.63, 3.10)	3.13* (1.89, 5.16)	0.001
No	109 (32.0%)	151 (51.4%)			
<b>Diabetics association membership</b>					
Yes	131 (38.4%)	55 (18.7%)	2.71 (1.88, 3.91)	1.59* (1.01, 2.50)	0.04
No	210 (61.6%)	239 (81.3%)			
<b>Having glucometer</b>					
Yes	57 (16.7%)	17 (5.8%)	3.27 (1.86, 5.76)	2.70* (1.37, 5.33)	0.004
No	284 (83.3%)	277 (94.2%)			
<b>Duration of DM</b>					
<5 years	200 (58.7%)	233 (79.3%)			0.000
5–10 years	88 (25.8%)	52 (17.7%)	6.86 (3.30, 14.26)	9.59* (3.99, 23.05)	
≥10 years	53 (15.5%)	9 (3.1%)	3.48 (1.59, 7.63)	4.84* (1.92, 12.23)	
<b>Diabetics-related comorbidity</b>					
No	189 (55.4%)	196 (66.7%)	1.61 (1.16, 2.22)	1.54* (1.01, 2.33)	0.043
Yes	152 (44.6%)	98 (33.3%)			
<b>Alcohol consumption</b>					
Yes	25 (7.3%)	31 (10.5%)			0.16
No	316 (92.7%)	263 (89.5%)	1.49 (0.86, 2.59)	1.64 (0.82, 3.26)	

\*Significant at  $p$ -value < 0.05.

self-care practice. As Orem's theory of self-care, self-care as "learned behavior composed of deliberate goals that direct actions" that is fundamental by "knowing" and "deciding."<sup>13</sup>

Diabetes patients who had been 5–10 years and >10 years diabetes illness duration had 9.59 (3.99, 23.05) and 4.84 (1.92, 12.23) times more likely adhere to diabetes self-care managements respectively compared to those less than 5 years duration. This was supported by study done in Thailand, which reveals that years of suffering from diabetes were predictor of self-care practices.<sup>17</sup> This may be due to long-term exposure with the disease resulted in experience of self-care management.

Patients' diabetes self-care management training was 3.13 (1.89, 5.16) times more likely adhere to diabetes self-care managements compared to their counter parts. Patients' self-care management interventions have demonstrated benefits in terms of both quality of life and glycemic control.<sup>18</sup> Patient without diabetes associated complications were 1.54 (1.01, 2.33) times more likely adhere to diabetes self-care management practice as compared to their counter parts. This was supported by study conducted in Tikur Anbessa Hospital, Ethiopia.<sup>10</sup>

In this study, diabetes association membership was 1.59 (1.01, 2.50) times more likely adhere to diabetes self-care management as compared to their counter parts, which was in

line with a study conducted in Felege Hiwot.<sup>12</sup> This might be due to the association's regular monthly diabetic education and support given to patients such as securing medicine to some of the lower-income members and blood glucose testing with a relatively lower price. However, according to this study, only 186 (29.3%) diabetes' patients were participated as members of a diabetes association. This might be due to the associations' poor advocacy and/or the physicians' negligence to explain about the importance of the diabetic association to gather information about diabetes self-care practice.

This study also indicated that, having private glucometer at home was 2.70 (1.37, 5.33) times more likely have adherence to diabetes self-care management practice as compared to their counter parts. This was consistent with study conducted in Tikur Anbessa Hospital,<sup>10</sup> which indicated that, having glucometer was associated with self-monitoring of blood glucose level. Therefore, having glucometer at home might reinforce patients to control their blood glucose level regularly.

### Strengths of the study

This study was under taken by different data collection methods and used contextually adapted standardized questionnaires that improve data quality. Professional mix of the researchers was also the strong side for this study.

### Limitations of the study

Recall bias and social desirability bias were the limitation of the study. Since self-care practices is determined based on the participants' self-reported values, performance of these behaviors were not observed and could not be confirmed. This was one of the limitations of our study. The other limitation of this study was the nature of the study design, which was cross-sectional which provides weak evidences compared to other designs.

### Conclusion

Significant number of diabetes patient had poor adherence to diabetes self-care practice. Being farmer, those having diabetic complication, those with less physical exercise and less eye examination practice were found to be significantly associated with poor adherence to diabetes self-care practice, so that periodical training and public health intervention should be given to prevent the complications associated with diabetes. Being government worker, training on diabetes' self-care, diabetes' association membership and having private glucometer were significant factors associated with good adherence of diabetes self-care management practice.

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### Author contributions

E.A. initiated the research, wrote the research proposal, conducted the research, did data entry and analysis, and wrote the manuscript. T.H.Z. involved in the write up of methodology of proposal and research work. M.G. and A.M. contributed in the designing of methodology, write up of proposal, did the analysis and write up of the manuscript. H.K. participated in the method development and manuscript edition and preparation. M.Z.W. and M.T.Y. involved in writing and editing the manuscript, data curation, data analysis and method development.

### Declaration of conflicting interests

The author(s) declared that no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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### Ethical approval

Ethical clearance was obtained from institutional review board (IRB) of Arab Minch University and permission letter was obtained from respected Public Hospital Administrators. The ethics approval number was "IRB/2643/2016."

### Informed consent

After information was provided about the objectives and importance of the study, verbal informed consent was obtained from the participants. Since the study was conducted using questionnaires/no any clinical trial was involved/only verbal informed consent was obtained. All these procedures were approved by the IRB of Arba Minch University. No minor subjects were involved in this study, so that written consent was not applicable from legally authorized representatives. All information were kept confidential.

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### Supplemental material

Supplemental material for this article were adopted from other similar studies [10].

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