

Medication Adherence and Contributing Factors Among Type 2 Diabetes Patients at Adama Hospital Medical College in Eastern Ethiopia

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Abstract

Introduction: Good glycemic control and preventing early complications are the ultimate targets of diabetes management, which depends on patients' adherence to regimens. Even though highly potent and effective medications have been developed and manufactured with astonishing advancement over the past few decades, excellent glycemic control has remained elusive.

Objective: This study aimed to assess the magnitude and factors associated with medication adherence among type 2 diabetes (T2D) patients on follow-up at Adama Hospital Medical College (AHMC) in East Ethiopia.

Methods: A hospital-based cross-sectional study was conducted among 245 T2D patients on follow-up at AHMC from March 1 to March 30, 2020. Medication adherence reporting scale-5 (MARS-5) was utilized to collect information regarding patients' medication adherence. The data were entered and analyzed using SPSS (Statistical Package for Social Sciences) version 21. The level of significance was declared at a p -value of $<.05$.

Results: Of the 245 respondents, the proportion of respondents who adhere to diabetes medication was 29.4%, 95% CI [confidence interval] (23.7%–35.1%). After adjusting for khat chewing and adherence to blood glucose testing as confounding factors, being married (AOR [adjusted odds ratio] = 3.43, 95%CI [1.27–4.86]), government employee (AOR = 3.75, 95%CI [2.12–7.37]), no alcohol drinking (AOR = 2.25, 95%CI [1.32–3.45]), absence of comorbidity (AOR = 1.49, 95%CI [1.16–4.32]), and having diabetes health education at health institution (AOR = 3.43, 95%CI [1.27–4.86]) were the factors associated with good medication adherence.

Conclusion: The proportion of T2D patients who adhere to medication in the study area was remarkably low. The study also found that being married, government employee, no alcohol drinking, absence of comorbidity, and having diabetes health education at a health institution were the factors associated with good medication adherence. Therefore, imparting health education on the importance of diabetes medication adherence by health professionals at each follow-up visit should be considered. Besides, awareness creation programs regarding diabetes medication adherence should be considered using mass media (radio and television).

Keywords

MARS-5, medication adherence, T2D, Adama Hospital Medical College, Ethiopia

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Introduction

Diabetes mellitus (DM) is a serious and rapidly growing public issue, which affects millions of people. Its prevalence is growing every year, reaching epidemic proportions (International Diabetes Federation (IDF), 2013; Mesfin et al., 2017). According to the International Diabetes Federation, 415 million people had diabetes in 2015, with a projection of 642 million by 2040 (International Diabetes Federation (IDF), 2015) and an estimated 8.5% of the

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world's population will have been affected by T2D by 2040 (Cho et al., 2018; Zheng et al., 2018). Globally, T2D is the most prevalent form (Islam et al., 2014) and accounts for 90% of all diabetes (World Health Organization, 2019). The overall rates of diabetes-related morbidity and mortality are higher in most low- and middle-income countries than in high-income countries (Islam et al., 2014).

The burden of T2D is increasing because of suboptimal glycemic control resulting in vascular complications (Lee et al., 2017). Achieving glycemic control and preventing early complications are the ultimate targets of diabetes management which depends on patients' adherence to regimens (Farsaei et al., 2011). Medication adherence (MA) is the extent to which an individual takes medication as directed by a healthcare professional (Asheq et al., 2021).

Adherence to diabetes medications is an important factor in managing diabetes and delaying diabetes-related complications (Nashat Hegazy, 2017; Rana et al., 2019), and preventing mortality and morbidity (DiMatteo, 2004; Juarez et al., 2013; Lee et al., 2017). The WHO defines adherence to long-term treatment as "the extent to which a person's behavior taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (Sabaté, 2003). According to the WHO report, the average adherence to long-term treatments for chronic diseases in developed countries is around 50%, and in developing countries, the adherence rate is even lower (Alqarni et al., 2019).

Review of Literature

The MA is a complex process that is affected by many different factors (DiMatteo, 2004). The factors associated with MA are age, sex, marital status, education, income, alcohol consumption, exercise, presence of comorbidities, duration of DM, the pattern of anti-diabetic treatment, presence of complications, type of medication, number of medications, treatment duration, glycemic control, side effects, treatment satisfaction, patients physician relationship and communication and clients had a negative perception about medication (Almadhoun & Alagha, 2018; Aloudah et al., 2018; Alqarni et al., 2019; Aminde et al., 2019; Awodele & Osuolale, 2015; Bekele et al., 2021; Benrazavy & Ali, 2019; Lee et al., 2017; Mesfin et al., 2017; Olorunfemi & Ojewole, 2019; Raimi, 2017; Thapar et al., 2020; Yosef, 2021; Zhou et al., 2019).

Medications are recommended strategies for dealing with hyperglycemia. Despite remarkable progress in developing and manufacturing highly potent and effective drugs over the past few decades, achieving good glycemic control has remained elusive. This is due to a lack of adherence to prescribed medications and other self-care practices (Wabe et al., 2011). The lack of adherence to medications leads to increased morbidity, mortality, and financial loss (Mesfin et al., 2017; Raimi, 2017; Rwegerera et al., 2018).

Achieving optimal glycemic control depends on the rational use of available anti-diabetic regimens, good adherence to prescribed treatments, and successful self-management (Yusuff et al., 2008). Therefore, this study aimed to assess the magnitude and associated factors of MA among T2D patients on follow-up at AHMC in East Ethiopia.

Methods

Study Design, Area, and Period

A hospital-based cross-sectional study was carried out among T2D at Adama Hospital Medical College (AHMC) from March 1 to March 30, 2020. AHMC is one of the oldest public hospitals in the country and it is found in Adama city, which has 220,212 populations according to the 2007 census statistical of Ethiopia. Adama city is located 90 km to the East of Addis Ababa, the capital city of Ethiopia. AHMC is a referral hospital and provides outpatient, inpatient, emergency, ambulatory, and other specialized services for the community living in the Eastern part of Ethiopia.

Populations

All T2D patients on follow-up and visiting chronic care service of AHMC were the study population. The study population was all T2D patients on follow-up and visiting chronic care service of AHMC, and who fulfilled the inclusion criteria (age ≥ 18 years, patients diagnosed with T2D, and patients who are willing to participate in the study) & present during the study period.

Sample Size Determination and Sampling Technique

The required sample size was determined using the simplified formula for proportions (*Taro Yamane*) ($n = \frac{N}{1+N*e^2}$) (Yamane, 1967). The total number of T2D patients who attend the AHMC chronic follow-up clinic were 562. Using a 5% precision of the estimate and adding 10% for non-response rate compensation, the final computed sample size was 257. The study participants were recruited at the time of their arrival at the hospital for monthly follow-ups. The convenience sampling technique was employed to select the potential participants until the required sample size was obtained.

Study Variables and Measurements

The dependent variable was treatment adherence. The independent variables were socio-demographic variables (age, sex, educational status, income, religion, marital status, and occupational status), patient and clinical characteristics (duration of diabetes treatment, comorbidity, and diabetes complication), and behavioral characteristics (smoking,

alcohol consumption, khat chewing, dietary, and knowledge of target blood glucose).

Adherence: The extent to which a person's behavior taking anti-diabetic medication corresponds with agreed recommendations from a health care provider (Wabe et al., 2011).

Adherent: When patients scored the mean and above the value of the medication adherence reporting scale-5 (MARS-5), otherwise non-adherent.

Good adherence to blood glucose testing: If the patient was found to measure his/her blood glucose for more than or equal to 4 days in the last seven days, otherwise poor (Sheleme et al., 2020).

Alcohol drinker: A patient who drinks alcohol every day or every other day basis whatever the amount was considered an alcohol drinker, otherwise not (Yosef et al., 2021).

Data Collection Tools and Procedures

The data were collected through a face-to-face interview using a structured and pretested questionnaire. MARS-5 was utilized to collect information regarding patients' MA. The MARS-5, a self-reported instrument, contains 5 items regarding MA. Each item was rated on a 5-point Likert scale, ranging from 1 (always) to 5 (never), and the range of the MARS-5 total score is between 5 and 25. Adherence level was measured by taking the summation of the response to 5 questions and categorized as poor and good if the total score was less than and greater than or equal to the mean, respectively. The training was given to data collectors and supervisors concerning the objective and process of data collection and to discuss the presence of an ambiguous question in the questionnaire.

Statistical Analysis

The data were entered and analyzed using SPSS (Statistical Package for Social Sciences) version 21. Descriptive statistics were undertaken. The results of the study were expressed in terms of frequencies and percentages and presented using tables. Bivariate and multivariable logistic regression analyses were used to identify independent variables associated with MA. Independent variables with a p -value $< .25$ in bivariate logistic regression were included in the multivariable logistic regression model. The Hosmer-Lemeshow goodness-of-fit test indicated ($p = .815$) that the model was good enough to fit the data well. The level of significance was declared at a p -value of $< .05$.

Results

Socio-Demographic, Behavioral, and Clinical Characteristics

Of the 257 total sample size, 245 study participants have completed the interview, giving a response rate of 95.3%.

The mean age of the participants was 48.6 (± 14.9 standard deviation) ranging from 18 to 85 years old. One hundred sixty (65.3%) of the participants were married. Forty (16.3%) of the study participants were khat chewers. Two hundred twenty-three (91%) and 135 (55.1%) of the participants had good adherence to blood glucose testing and comorbidity respectively (Table 1).

Medication Adherence Reporting Scale Score

Seventy (28.6%) of the respondents always forgot to take their medication. Eighty-nine (36.3%) of the respondents always decided to skip their medication when they feel their condition is under control. The proportion of respondents who adhere to diabetes medication was 29.4%, 95% CI (confidence interval) (23.7%–35.1%) (Table 2).

Factors Associated With Medication Adherence

After adjusting for khat chewing and adherence to blood glucose testing as confounding factors, being married (AOR [adjusted odds ratio] = 3.43, 95%CI [1.27–4.86]), government employee (AOR = 3.75, 95%CI [2.12–7.37]), no alcohol drinking (AOR = 2.25, 95%CI [1.32–3.45]), absence of comorbidity (AOR = 1.49, 95%CI [1.16–4.32]), and having diabetes health education at health

Table 1. Socio-demographic, Behavioral and Clinical Characteristics of the Respondents at AHMC in Ethiopia.

Variables	Categories	Frequency	Percent
Sex	Male	135	55.1
	Female	110	44.9
Age	< 49	126	51.4
	\geq 49	119	48.6
Marital status	Unmarried ^a	85	34.7
	Married	160	65.3
Educational status	No formal education	76	31.0
	Formal education	169	69.0
Occupational status	Government employee	88	35.9
	Others ^b	157	64.1
Alcohol drinking	Yes	19	7.8
	No	226	92.2
Khat chewing	Yes	40	16.3
	No	205	83.7
Adherence to blood glucose testing	Yes	22	9
	No	223	91
Diabetes health education at HI	Yes	123	50.2
	No	122	49.8
Comorbidity	Present	175	71.4
	Absent	70	28.6

HI = Health Institution

^aSingle, divorced, separated.

^bMerchant, farmer, daily labor and unemployed.

Table 2. Medication Adherence Reporting Scale (MARS-5) of the Respondents at AHMC in Ethiopia.

S.N	Questionnaires	Always	Usually	Sometimes	Rarely	Never
1	Do you forget to take your medication?	70 (30.6%)	55 (22.5%)	35 (14.3%)	54 (22%)	31 (12.6%)
2	Do you stop taking medication for a while?	85 (34.7%)	38 (15.5%)	31 (12.6%)	44 (18%)	47 (19.2%)
3	Do you decide to skip one of your medications?	89 (36.3%)	35 (14.3%)	55 (22.5%)	26 (10.6%)	40 (16.3%)
4	Do you use your medication less than prescribed?	31 (12.6%)	23 (9.4%)	55 (22.5%)	58 (23.7%)	78 (31.8%)
5	Do you change the dosage of your medication?	90 (36.7%)	68 (27.8%)	39 (15.9%)	18 (7.4%)	30 (12.2%)

institution (AOR = 3.43, 95%CI [1.27–4.86]) were the factors associated with MA (Table 3).

Discussion

Adherence to anti-diabetic medication is a known cornerstone in the management of type 2 diabetic patients (Mirghani, 2019). Based on the above fact, this study aimed to assess the magnitude and associated factors of MA among type 2 diabetes (T2D) patients on follow-up at AHMC in East Ethiopia. The proportion of T2D patients who had good MA was 29.4%, 95% CI (23.7%–35.1%). This finding was in line with 31.8% in Beirut, Lebanon (Mroueh et al., 2018). But, this study was much lower than 48.7% in Addis Ababa (Mesfin et al., 2017), 75.5% in Jimma (Teklay et al., 2013), and 85.1% in Gondar (Abebaw et al., 2016) studies in Ethiopia, 45.6% in Cameroon (Aminde et al., 2019), 58.2% in Gaborone, Botswana (Rwegerera et al., 2018), 40% in Ibadan (Adisa et al., 2011) and 72.5% in Lagos (Azodo & Omuemu, 2017) studies in Nigeria, 44.7% in Egypt (Nashat Hegazy, 2017), 38.5% in Ghana (Bruce et al., 2015), 47.3% in Gaza, State of Palestine (Almadhoun & Alagha, 2018), 40% in Riyadh (Aloudah et al., 2018) and 68.5% in Jeddah (Alshehri et al., 2020) studies in Saudi Arabia, 39% in Bangalore (Imran & Plathottam, 2017) and 50.9% in Karnataka (Kumar et al., 2021) studies in India, 53.6% in Bangladesh (Mannan et al., 2021), 43.1% in Guangdong Province, China (Zhou et al., 2019), and 49.3% in Cambodia (Nonogaki et al., 2019). The variation observed between this and other studies conducted elsewhere was majorly due to the difference in the operational definitions used, and the sample size across studies. Besides, the difference in the sociodemographic, sociocultural, educational, lifestyle factors, spiritual, religious, and financial characteristics, public health services, diabetes management, and ongoing policies may be responsible for the observed variation.

Marital status was significantly associated with MA. Respondents who were married were 3.4 times more likely to have good MA compared to unmarried. This finding was supported by studies conducted elsewhere (Almadhoun & Alagha, 2018; Wu et al., 2012). This could be due to the remainder and help from patients' families to perform self-care activities and create an appropriate environment to

reinforce adherence such as preparing a healthy diet and sharing exercises (Almadhoun & Alagha, 2018). However, some studies revealed that patients who are living alone and had chronic illnesses had a decent level of adherence (Feda et al., 2022; Rezaie et al., 2019). This is because people who live alone have no chance of family support and have no expectations from anyone, so they do everything on their own. As a result, they are better able to perform tasks such as better self-care and MA.

The occupational status of the respondents had a significant relationship with MA. Respondents who were government-employed were 3.8 times increased odds of having good MA compared to those who were not government-employed. This finding was supported by Rezaie et al. (2019). However, studies done by Imran and Plathottam (2017) and Rana et al. (2019) revealed that employed was found to be significantly non-adherent to anti-diabetic medication than not employed. This could be due to employed patients being under pressure or feeling stressed due to the nature of their job, which results in forgetting to take their medications.

Alcohol consumption was significantly associated with MA. Respondents who are not alcohol consumers were 2.3 times increased odds of having good MA. This finding was supported by studies conducted elsewhere (Ahmed et al., 2006; Aminde et al., 2019; Nonogaki et al., 2019), which revealed that increased risk for poor adherence to diabetes self-care behaviors with increasing alcohol consumption. This could be due to active substance use or association with substance users leading to a disorganized lifestyle that can make adherence to a medication regimen difficult and can directly impair judgment about health behaviors.

Comorbidity was significantly associated with MA. Respondents who had no comorbidities were 1.5 times more likely to have good MA compared to those who had comorbidities. This finding was supported by a study conducted in Saudi Arabia (Alqarni et al., 2019). This could be due to reduced adherence in patients with several comorbidities due to multiple medications. A patient with regimen complexity could pose a challenge to continued adherence to all prescribed medications (Ahmed et al., 2006). Generally, the number of drugs taken by patients was dependent on DM severity and associated comorbidities. So, patients with diabetes with comorbidities generally have more drugs of different pharmacological classes. This complex treatment

Table 3. Factors Associated With Medication Adherence of the Respondents at AHMC in Ethiopia.

Variables	Categories	Medication adherence		COR (95% CI)	AOR (95% CI)	p-value
		Poor	Good			
Marital status	Unmarried [§]	73	12			
	Married	100	60	3.65(1.29–4.98)	3.43(1.27–4.86)	.014
Occupation status	Government employee	46	42	3.87(2.17–6.89)	3.75(2.12–7.37)	<.001
	Others [#]	127	30			
Alcohol drinking	Yes	70	16			
	No	103	56	2.38(1.38–3.24)	2.25(1.32–3.45)	.006
Khat chewing	Yes	35	5			
	No	138	67	0.29(0.11–0.79)	0.36(0.12–1.05)	.062
Adherence to blood glucose testing	Good	16	6			
	Poor	157	66	1.12(0.68–1.83)	1.36(0.65–2.87)	.414
Comorbidity	Present	128	47			
	Absent	45	25	1.51(1.02–3.40)	1.49(1.16–4.32)	.045
Diabetes health education at HI	Yes	78	45	2.03(1.16–3.57)	1.99(1.11–3.78)	.023
	No	95	27			

AOR = adjusted odds ratio; CI = confidence interval; COR = crude odds ratio; HI = health institution.

regimen could be a factor that contributes toward non-adherence, as people tend to forget to take their medications when they are exhausted from work (Alqarni et al., 2019). Chronic disease patients' adherence to treatment is significantly impacted by factors relating to medications (Rezaie et al., 2019). In general, a rise in the number of dosages per day or polypharmacy results in a decline in treatment adherence (Marcum & Gellad, 2012).

Diabetes health education was significantly associated with MA. Respondents who had diabetes health education at health institutions were two times increased odds of having good MA. This finding was supported by studies conducted elsewhere (Almadhoun & Alagha, 2018; Awodele & Osulale, 2015). This could be due to the more knowledge you have regarding how and when to take your medication, how to monitor your blood sugar (glucose), and how to take care of yourself, which helps you manage your diabetes better and increases the chance of adherence to the diabetes medication (Centers for Disease Control and Prevention, 2021). However, another study revealed that patients who did not get any education about DM were more likely to be adherent (Almadhoun & Alagha, 2018). A possible explanation is that diabetes education might have been recommended or used by patients already having difficulties with MA.

Strength and Limitations

This study used the standard MARS-5 tool to assess MA considered the strength of the study. However, this had some limitations. The study first considers people older than 65, but due to some cognitive issues (increased level of dementia and forgetfulness), additional comorbidities, and polypharmacy, MA in senior patients is particularly challenging. The second is the exclusion of some significant independent

variables that influence how well patients take their medications, such as the length of their diabetes and their treatment, their HbA1c level, their family history of diabetes, any complications linked to their diabetes medications, their family's income, and how frequently they use medical services. Third, MA may vary depending on the type of therapy. The majority of individuals in this study received oral anti-diabetic drugs, while some also used insulin. As a result, it may not be possible to determine which type of treatment has higher rates of observed adherence.

Implication for Practice

Non-adherence to medication regimens can have detrimental effects on both the patient and the physician. It is a significant public health issue because of the possible impact that medication non-adherence may have on the provision of health-care. Therefore, it is crucial to give patients precise prescription information to increase adherence and achieve better glycemic control.

Conclusion

The proportion of T2D patients who adhere to medication in the study area was remarkably low. The study also found that being married, government employee, no alcohol drinking, absence of comorbidity, and having diabetes health education at a health institution were the factors associated with good MA. Therefore, imparting health education on the importance of diabetes MA by health professionals at each follow-up visit should be considered. Besides, awareness creation programs regarding diabetes MA should be considered using mass media (radio and television).

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Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by TY, DN, ET, EA, and NS. The first draft of the manuscript was written by TY and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Ethical approval was obtained from Mizan-Tepi University-Ethical Review Committee (MTU-ERC). Permission was obtained from AHMC. The study participants were informed about the purpose of the study, their right to deny participation, anonymity, the confidentiality of the information and this study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from participants who participated in the study.

Availability of Data and Materials

The data set is handled by the corresponding author and can be provided upon request.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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