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Research Article

Adherence of Medication and Associated Factors Among Type II Diabetic Patients at Wolaita Sodo University Comprehensive Specialized Hospital, Ethiopia: a Cross-Sectional Study

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Abstract

Background

Poor anti-diabetic medication adherence results in poor glycemic control and can induce treatment failures, accelerated complications, and increased risk of mortality. There is a lack of information on the level of adherence to anti-diabetic medication in the study area. Therefore, this study aimed to assess adherence and associated factors towards anti-diabetic medications among type II diabetic patients on follow-up at Wolaita Sodo University teaching referral hospital.

Methods

A facility-based cross-sectional study was conducted among 418 type II diabetic patients. Morisky Medication Adherence Scale (MMAS) scores were used to measure the adherence level. Data were collected by a pretested interviewer-administered structured questionnaire. Data were coded and entered into EpiData version 3.2 and analyzed using STATA version 15. Binary logistic regression analysis was conducted to identify factors associated with adherence. An adjusted odds ratio, along with a 95% confidence interval, was reported to show the strength of the association. Variables with a p-value <0.05 were considered statistically significant. The goodness-of-fit was checked by the Hosmer–Lemeshow test.

Results

The magnitude of antidiabetic adherence medication was found to be 68.9%. Age above 60 years [AOR: 3.24, CI:(1.44, 7.27)], college and above [AOR: 2.98, CI:(1.09, 8.11)], duration of diabetes [AOR: 2.58, CI:(1.47, 4.54)] and medication availability [AOR: 2.21, CI:(1.05, 4.64)] were positively associated with antidiabetic adherence medication, while diabetes complications [AOR: 0.147, CI:(0.081,0.265)] was negatively associated with antidiabetic adherence medication.

Conclusion

The level of medication compliance was suboptimal in this study. Patients' ages, educational levels, diabetes complications, duration of diabetes, and access to medication in the hospital are independent factors associated with antidiabetic drug adherence. Strategies that further increase the availability of anti-diabetic drugs, provide counseling, and accentuate special attention for individuals who have developed diabetes complications may aid in boosting adherence levels.

Keywords: Adherence, Diabetes, Antidiabetic, WSUCSH

Abbreviations

AOR - Adjusted odds ratio
EDHS- Ethiopian demographic health survey
DM - Diabetes Mellitus
IDF - International Diabetes Federation
WSUTRH - Wolaita Sodo University Teaching Referral Hospital

1. Introduction

Adherence is described as a patient's ability to adhere to a treatment regimen, take drugs as directed, and abide by dietary and other medication prohibitions [1]. One of the 21st century's growing public health concerns is diabetes. Around the world, 463 million people have diabetes as of 2019 [2]. There were 19 million diabetics in Africa, and by 2045, that number is projected to reach 45 million [3]. Ethiopia is projected to be one of the top 10 countries for the number of people with impaired glucose tolerance, with an estimated 1.7 million people living with diabetes, and more than 90% of cases of diabetes mellitus were Type 2 (T2DM) (2).

Patients with type 2 diabetes tend to have higher morbidity and mortality rates due to the condition's prevalence, sneaky onset, and delayed diagnosis, especially in resource-poor developing nations [4]. To prevent the likelihood of both acute and long-term complications, the management of diabetes patients requires a multimodal approach with a focus on ongoing medical care in addition to self-management and lifestyle modification education [5,6]. It is well-recognized that good medication adherence helps diabetic patients maintain stable blood sugar levels.

Poor adherence to anti-diabetic medicine, however, posed a hurdle to reducing the consequences of diabetes in low- and middle-income (LMIC) countries [7]. According to various studies, adherence to diabetic treatment is unsatisfactory in Ethiopia and varies by context, ranging from 31.2% to 85.1% (8,9). Various studies reported that medication adherence is influenced by several factors such as lack of information [10,11], the complexity of the regimen(10, 11), comorbidity [12], and perceptions of benefits, side effects, medication cost, and duration of diabetes [9,11,13]. Personality and economic factors may influence the adherence-compliance rate [14-16]. Institutional factors such as the availability of medication at the hospital pharmacy [14,17], cost of medications, prescription patterns, and accessibility also affect adherence
[10,13]. Also, personal beliefs(18), knowledge of disease and medication (9,14), forgetfulness, and financial burden also reduce adherence levels [11,17].

Poor and insufficient glycemic control in people with Type 2 diabetes mellitus (DM) is a significant public health issue and accelerates the onset of diabetes complications [19]. Subsequently, it can result in more frequent hospitalizations and acute care visits, lower patient satisfaction, increased healthcare expenses, and result in early demise [17,20].

According to a World Health Organization report, improving the efficacy of adherence strategies may have a considerably greater influence on the health of the community than any improvement in specific medical treatments [20]. In countries with limited resources, such as Ethiopia, there are significant challenges to taking anti-diabetic medication. It's essential to pinpoint the causes of non-adherence and create plans to boost sustained compliance. Regarding the study area's adherence to anti-diabetic medicine, there is a paucity of information. Contradictory ideas on the factors associated with adherence to anti-diabetic treatment have been reported in the literature. Therefore, the purpose of this study was to determine the degree of adherence to anti-diabetic drugs and the factors that contribute to it among type II diabetic patients at WSUCSH.

2. Materials and Methods

2.1 Study Design, Setting, and Period

An institution-based cross-sectional study was conducted at Wolaita Sodo University Comprehensive Specialized Hospital. It is located at Wolaita Sodo town, South Regional State. Wolaita Sodo town is found at 327 km from Addis Ababa, the capital city of Ethiopia, in the southern part of the country. WSUCSH is the only referral hospital in the Wolaita Zone and provides specialized services to about 15 million people in the catchment. The hospital is serving service for more than 2000 diabetic patients (Hospital monthly HMIS report). The study was conducted from December 1, 2020, to May 30, 2021.

2.2 Population

All type 2 diabetic patients who are registered for the service in the hospital were the source population. Type 2 diabetic patients attending WSUCSH during the data collection period were included in the study. While type 2 diabetic patients who are seriously ill, admitted, and with psychiatric cases were excluded from the study.

2.3 Sample Size Determination and Sampling Procedure

The sample size was calculated based on a single population proportion formula by using open Epi 2.3, considering the following assumptions: anticipated prevalence of antidiabetic medication 54.8% (14), 95% confidence interval, 5% margin of error, and 10% non-response rate. Hence, the total sample size for this study was 418. The daily registration book's flow and appointments for the past two months are counted before the data collection period. A systematic random sampling procedure with a sample interval of every third patient was used to recruit study participants when they arrived at the clinic.

2.4 Data Collection Methods and Tools

The questionnaire was prepared in English version then it was translated into the Amharic language and then back-translated to English to maintain conceptual consistency. The consistency of translation was checked and maintained by both the principal investigator and other experts. The data were collected by using a pre-tested structured questionnaire. The questionnaire consists of the socio-demographic characteristics of the respondents, queries to assess contributing factors of adherence, and queries to assess the knowledge and practice of the respondents towards taking ant diabetic medications were included. The level of adherence assessment was measured by the Morisky Medication Adherence Scale-8 (MMAS-8).

2.5 Variables of the Study

The dependent variable was adherence to antidiabetic medication. The independent variables were socio-demographic variables, such as age, sex, education, marital status, income level, and occupation. Clinical variables, such as the presence of comorbidity, disease duration, complications, and Institutional factors, such as availability of medications and doctors on the appointment day.

3. Operational Definitions

3.1 Medication Adherence is defined as the proportion of prescribed doses of medication taken by a patient over a specified period.

3.2 Modified Morisky's Adherence Scale (MMAS) [21] was used to measure patients' adherence to their medication. MMAS is an 8-item self-report measure of adherence. Items 1 through 7 have response choices "yes" or "no", whereas item 8 has a 5-point Likert response choice. Each 'no' response was rated as '1' and each 'yes' as '0'except for item 5 (reversed), in which each response 'yes' was rated as '1' and 'no' as '0'. Item 8 concerning the difficulty in taking medications was scored as "Never/Rarely = 0, Once in a while = 1, Sometimes = 2, Usually = 3, and all the time = 4. The total score ranges from 0 to 8 and is grouped into three levels: high adherence (score = 8), medium adherence (score of 6 to < 8), and low adherence (score<6.

3.3 Data Quality Management

A pretest was carried out on 5 % of the sample population at Soddo Christian Hospital. The questionnaire was objective-based, logically sequenced, non-leading, and pretested. The data collector was provided with intensive training on the objectives of the study. Data were collected by two BSc nurses and one supervisor. The principal investigator checked the daily collected data for any incompleteness and possible corrections. Double data entry was implemented to minimize errors during data entry.

3.4 Data Processing and Analysis

The data were checked for completeness and internal consistency by cross-checking, then coded and double-entered into the Epi-Data version 3.1 and then exported to STATA version 15. Descriptive statistics were used to describe the nature of the study participants. Binary logistic regression analysis was conducted to determine factors associated with adherence. Variables with a p-value ≤ 0.25 in the bivariable analysis were candidates for the final multivariable model. Multi-collinearity among independent variables was checked via the variance inflation factor (VIF), and the mean VIF was 1.77. An adjusted Odds ratio, along with 95% Confidence intervals, was used to estimate the strength of measuring the association between dependent and independent variables. The level of statistical significance was considered at a p-value < 0.05. The goodness of the final model was checked by the Hosmer-Lemeshow goodness-of-fit test (p value= 0.399)

4. Results

4.1 Socio-Demographic Characteristics

A total of 409 patients participated in the study, yielding a response rate of 97.8%. Two hundred fifty-eight (63.08%) of patients were males, and 226 (55.26 %) of patients were dwelling in urban areas. Regarding age, 231 patients (56.5%) were in the 41- through the 59-year-old age range, with a mean age of 50 ± 10.44 years. The vast majority, 377 (92.18 %) of patients were married. More than a quarter of them (27.38%) were housewives, and 27.9% had completed their secondary school (Table 1).

Variables	Categories	Frequency	Percent
Sex	Female	151	36.1
	Male	258	63.1
Age	18-40 years	90	22
	41-59 years	231	56.5
	> 60 years	88	21.5
Educational level	No formal education	106	25.9
	Primary level complete	94	23
	Secondary level complete	114	27.9
	College and university graduates	95	23.2
Marital status	Single	28	6.85
	Married	377	92.18
	Widowed and divorced	4	0.98
Income	< 500	299	73.11
	501-2000	16	3.91
	>2000	94	22.98
Residence	Urban	226	55.26
	Rural	183	44.74

Occupation	Housewife	112	27.4
	Student	18	4.4
	Farmer	86	21
	Daily laborer	22	5.4
	Employed	79	19.3
	Merchant	37	9
	Retired	52	12.7
	Unemployed	3	.7

Table 1: Socio-demographic characteristics of participants who attended chronic care in Wolaita Sodo University Teaching Referral Hospital, southern Ethiopia,2021

4.2 Individual and Institutional Factors

Thirty-five percent of patients have had diabetes mellitus for more than or equal to five years, and 10% have a family history of the disease. Diabetic complications have appeared in one-fourth of them. Regarding the service rendered,353 (86.3%) of them got the doctor on their appointment day, and 48 (11.7%) did not have access to all of their diabetes medications at the hospital pharmacy (Table 2).

Variables	Categories	Frequency	Percent
Family history of diabetes	Yes	43	10.5
	No	366	89.5
Duration of DM	<5 years	265	64.8
	>5 years	144	35.2
Diabetic complications	Yes	101	24.7
	No	308	75.3
Do you always get your doctor on the appointment day?	Yes	353	86.3
	No	56	13.7
Do you always get your prescribed diabetic medication from the hospital?	Yes	361	88.3
	No	48	11.7

Table 2: Individual and institutional characteristics of participants attending chronic care in Wolaita Sodo University Teaching Referral Hospital, Southern Ethiopia, 2021

4.3 Magnitude of Antidiabetic Medication Adherence

The MMAS's mean (SD) score in this study was .64±1.9. As a result, 58.7% of participants indicated good adherence, 10.2% medium adherence, and 31.1% low adherence. Overall, 282 participants took their anti-diabetic medicine as prescribed, with a prevalence of 68.9% [95% CI;64.4-73.4] (Figure 1).

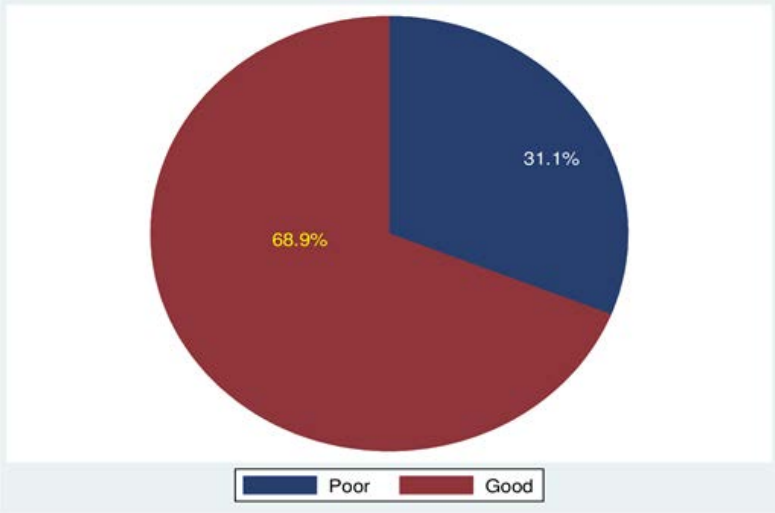

Figure 1: The proportion of antidiabetic medication among participants attending WSUTRH, Southern Ethiopia,2021.

Questions		Responses (%)	
		Yes	No
1.	Do you sometimes forget to take your diabetes pills?	139(34)	270(66)
2.	Over the past two weeks, were there any days when you did not take your diabetes medicine?	67(16.4)	342(83.6)
3.	Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?	30(7.3)	379(92.7)
4.	When you travel or leave home, do you sometimes forget to bring along your medications?	90(22)	319(78)
5.	Did you take your diabetes medicine yesterday?	61(14.9)	348(85.1)
6.	When you feel like your blood glucose is under control, do you sometimes stop taking your medicine?	15(3.7)	394(96.3)
7.	Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood glucose treatment plan?	36(8.8)	373(91.2)
8.	How often do you have difficulty remembering to take all your medicine? (A = 0; B–E = 1 where A. Never/rarely; B. Once in a while, C. Sometimes; D. Usually; E. All the time).	120(29.3)	289(70.7)

Table 3: Frequency Distribution of Responses to Medication Adherence-Related Questions Among DM Patients at the Wolaita Sodo University Teaching Referral Hospital, Southern Ethiopia, 2021

4.4 Factors Associated with Antidiabetic Medication Adherence

In the bivariable analysis, nine variables (demographic factors such as age, educational status, income, and occupation), diabetic complications, duration of DM, and availability of medications and getting doctors on their appointment were independent factors associated with antidiabetic medication adherence. However, multivariable analysis age, educational status, diabetic complications, duration of DM, and availability of medication were independent factors affecting antidiabetic medication adherence.

The likelihood of antidiabetic medication adherence was 3.24 [AOR: 3.24, CI:(1.44, 7.27)] times higher for those aged above 60 years than those aged 18-40 years. For those who had completed primary, secondary, and tertiary education levels, respectively, the odds of taking anti-diabetic medications were about 2.97 [AOR: 2.97, CI:(1.52, 5.79)], 2.67 [AOR: 2.67, CI:(1.39, 5.14)], and 2.98 [AOR: 2.98, CI:(1.09, 8.11)] times higher than those who had not attended formal education.

Those who had been clinically diagnosed with diabetes for five years or more were 2.58 times more likely to be adherent [AOR: 2.58, CI: 1.47, 4.54]. The odds of antidiabetic medication adherence were 2.21 times higher for those who had always been prescribed diabetic medication from the hospital when compared with their counterparts [AOR: 2.21, CI: 1.05,4.64]. Furthermore, compared to those who had not had diabetes complications, those who had developed diabetic complications were 85.3% less likely to adhere to antidiabetic medication. [AOR: 0.147, CI: (0.081,0.265)] (Table 4).

Variables	Categories	Antidiabetic adherence		COR 95% CI	AOR 95% CI
		Good	Poor		
Sex	Female	100(66.2)	51(33.8)	1	
	Male	182(70.5)	76(25.9)	1.22(0.74, 1.87)	
Age	18-40 years	56(62.2)	34(37.8)	1	1
	41-59 years	159(68.8)	72(31.2)	1.34(.80,2.31)	1.49(0.87,2.70)
	> 60 years	67(76.1)	21(23.9)	1.93(1.01, 3.70)	3.24(1.44,7.27) *
Educational level	No formal education	51(48.1)	55(51.9)	1	1
	Primary	69(73.4)	25(26.6)	2.97(1.64, 5.39)	2.97(1.52, 5.79) **
	Secondary	83(72.8)	31(27.2)	2.88(1.64, 5.06)	2.67(1.39, 5.14) **
	Tertiary	79(83.2)	16(16.8)	5.32(2.75, 10.2)	2.98(1.09,8.11) *
Income	< 500	192(64.4)	106(35.6)	1	
	501-2000	14(87.5)	2(12.5)	3.86(0.86, 17.3)	4.39(0.73, 26.3)
	>2000	76(80)	19(20)	2.20(1.26,3.80)	1.23(0.42, 3.61)

Occupation	Employee	67(84.8)	12(15.2)	2.98(1.55, 5.74)	2.29(0.80, 6.57)
	Nonemployee	215(65.2)	115(34.8)	1	
Duration of DM	<5 years	173(65.3)	92(35.7)	1	1
	>5yeras	109(75.7)	35(24.3)	1.65(1.04, 2.61)	2.58(1.47, 4.54) **
DM complication	Yes	45(44.6)	56(55.4)	0.24(0.15,0.38)	0.147(0.81,0.265) **
	No	237(76.9)	71(23.1)	1	1
Doctors' availability	Yes	252(71.4)	101(28.6)	2.16(1.21, 3.83)	1.73(0.87, 3.46)
	No	30(53.6)	26(46.4)	1	1
Medication availability	Yes	247(67.9)	117(32.1)	0.60(0.28, 1.26)	2.21(1.05, 4.64) *
	No	35(77.8)	10(22.2)	1	
Note * significant at a p-value <0.05 level and ** significant at a p-value<0.001 level, AOR: adjusted odds ratio; DM diabetes mellites					

Table 4: Bivariable and multivariable logistic regression analysis factors associated with antidiabetic medication adherence among patients attending chronic care in Wolaita Sodo University Comprehensive Specialized Hospital, southern Ethiopia, 2021

5. Discussion

This study revealed that the adherence rate of the participants to their medication was 68.9% [95%CI; 64-73]. Older age, educational level, diabetic complications, and availability of medication were independently associated with adherence to antidiabetic medication. This finding is comparable to a study done in Dilla University Referral Hospital 66% [16], but the finding was higher than a study done in northern Ethiopia 36.1% [10], in Zewditu Memorial hospital 54.8% [14], in Cameroon 45.6% [15], in Sudan 62.7% [22] and Botswana 58.2% [12].

In contrast, the finding is lower than a study done in Saudi Arabia80%(1), Uganda, at 83.3% [13], Gondar Hospital at 85.1% [9], and Eritrea at 86.3% [11]. This discrepancy may be caused by the time lag, the COVID-19 pandemic, the sample size and sampling technique, the cut point, the participants' maximum enrolment age, variations in the source population, and the medication adherence measuring method.

The use of anti-diabetic medications is significantly influenced by age. We discovered that adherence increased by three times in those over the age of 60. This finding is consistent with a systematic review and meta-analysis report [23]. Likewise, patients aged more than 60 years had 52% significantly lower odds of being non-adherent to their medication compared to those less than 60 years [15]. On the contrary, in another study, those aged above 60 years were independently associated with poor glycemic control [24].

Consistent with existing literature, this study revealed that education level was significantly correlated with the level of adherence to anti-diabetic medication. Studies have shown that education level is a significant socioeconomic determinant of compliance with anti-diabetic treatment [9,14]. Low educational level has been associated with higher rates of non-adherence [25]. While in other studies, educational level was not found to a statistically significantly associated with the adherence level of the respondents [12,22]. This could be because the literacy level of individuals is one of the strongest determinants of healthcare-seeking behavior. Educated people are more knowledgeable about the complications of diabetes and drug regimens, and they adhere to their medications.

One of the important factors that influenced the level of adherence to anti-diabetic medicine was the accessibility of medications. The finding was supported by other studies that indicated an association between medication adherence and medication availability [11,13]. Lack of medications in the health institution hurts patient adherence(14). This could be because people cannot afford to purchase medications from the private sector due to the high cost of medications.

According to the study, adherence has a negative relationship with diabetes complications. Participants who experienced complications from their diabetes were 85.3% less likely to take their medicine consistently than those who did not. This finding is supported by the study done in Tikur Anbessa Specialized Hospital, Ethiopia [25], where the presence of diabetes complications was positively associated with non-adherence.

Another factor that was found to be significantly associated with the respondents' adherence level was the duration of time they had had diabetes. Patients who had had diabetes for five years or more since a medical diagnosis were more likely to be adherent than those who had had it for less time. This finding was supported by other studies [11,13,26], patients who had been diabetic for 5 years or above are more adherent than less than 5 years. This may be explained by the fact that people with diabetes who regularly interact with healthcare providers are more likely to get repeated advice on medication adherence and become aware of the acute and long-term complications of uncontrolled blood sugar. This study has some important limitations that should be considered cautiously while interpreting the results. First, the study is single-centered, and it may limit its generalizability.

Secondly, due to the nature of the study design, the cause-and-effect relationship between the dependent variable and the independent variables cannot be established.

6. Conclusion

The results of the current study showed that type II diabetes patients in WSUTRH demonstrated suboptimal adherence to their anti-diabetic medications. Age, education level, diabetes duration, complications from diabetes, and hospital medicine are all independent variables associated with antidiabetic drug adherence. Therefore, strategies that further increase the accessibility of anti-diabetic medications, provide counseling, and place a special emphasis on those who have developed diabetes complications may aid in boosting adherence rates among diabetes patients.

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Authors' contributions

SF wrote the proposal, participated in data collection, analyzed the data, and drafted the paper. TA and DD revised and approved the proposal and participated in data analysis and subsequent drafts of the manuscript. All authors read and approved the final manuscript.

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Availability of Data and Materials

The data will be available from the corresponding author upon justifiable requests.

Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board/ IRB of Wolaita Sodo University, College of Medicine and Health Science, and conducted according to the principles of the Declaration of Helsinki. Informed consent was provided by the participants. It was obtained from parents or legal guardians for those who cannot read or write. Participants' involvement in the study was voluntary, and they didn't ask to write either their name or their address.

Consent for Publication

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

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