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Medication Non-Adherence among Type-II Diabetes Mellitus Out-Patients Attending at Tertiary Care Hospital, Nepal

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Abstract

Background: Diabetes mellitus is a rising global hazard. Medication non-adherence is increasing the burden of type-2 diabetes mellitus (T2DM), which has a direct influence on poor health outcomes, greater healthcare costs, and a rise in the number of comorbid cases and death. In developing countries like Nepal, where economic instability and restricted access to healthcare facilities may have led to an increase in medication non-adherence, non-adherence studies are essential.

Objective: This study aimed to assess medication non-adherence in patients with T2DM and identify associated factors and its predictors in Nepalese setting.

Method: Patients diagnosed with T2DM in the Out-Patients Department (OPD) above the age of 25 are included in the research. This was a four-month Hospital based descriptive cross-sectional study. The data of the study were analyzed by using SPSS 26.0 version and Microsoft Excel 2017. Logistic regression analysis was used to associate factors with medication non-adherence.

Result: Non-adherence was found in 65.1 percent of the 175 T2DM patients in the study. Factors that were associated with non-adherence were: age group (AOR=22, 95%CI: 4.4-112), an education level (AOR=24, 95%CI: 4.3-138), employment status (AOR=8.2, 95%CI: 1.6-42.5), monthly income (AOR=13, 95%CI: 2.4-78.6), duration of diabetes (AOR=45, 95%CI: 6.1-127.1), and presence of diabetic complications (AOR=5.2, 95%CI: 1.2-22.8).

Conclusion: The level of adherence to diabetes medication was unsatisfactory. Predictors of non-adherence were age group, education, employment, income, duration of disease, and diabetic complications. Patients should be encouraged to take anti-diabetic medications as prescribed and frequent awareness of the benefits of doing so should be fostered to prevent non-adherence.

Keywords: Type-2 Diabetes Mellitus; Non-adherence; Morisky Medications Adherence Scale (MMAS); Nepal

Introduction

Diabetes mellitus is a set of metabolic disorders defined by persistent hyperglycemia caused by abnormalities in insulin production, insulin action, or both. In Type 2 diabetes, the body develops resistance to the effects of insulin, and/or the pancreas' ability to generate enough insulin is gradually lost [1]. Uncontrolled diabetes can lead to a variety of microvascular and macro vascular problems in the short and long term [2]. The ultimate goals of diabetes treatment are glucose control and the prevention of early complications, both of which are dependent on the patient's compliance with regimens [3].

Diabetes mellitus (DM) is a rising global hazard; population's growth, aging, epidemiological factors are important contributing factors for DM [4]. WHO estimates that between 2000 and 2030, the world population will increase by 37% and the number of people with diabetes will increase by 114% [5]. Diabetic Mellitus is more common in developing countries, notably Southeast Asia. According to International Diabetes Federation (IDF), approximately 463 million adults aged 20-79 years had diabetes in 2019, with the number expected to rise to 700 million (51 percent) by 2045. Diabetes affects 88 million adults in Southeast Asia, with the number expected to rise to 153 million (74 percent) by 2045. Also, 1 in 11 individuals (20-79 years) has diabetes, 3 out of 4 (79%) adults with diabetes live in low- and middle-income countries, and diabetes account for 10% of global health spending (USD76O billion) [6]. From the study titled "Global estimates of the prevalence of diabetes for 2010 and 2030," the number of individuals with diabetes would rise by 69 percent in developing nations and 20 percent in developed nations between 2010 and 2030. In developed nations, 85–95 percent of all diabetes cases are type 2, and the number is considerably greater in developing nations [7].

According to the Nepal Diabetes Association (NDA), diabetes affects around 15% of individuals over the age of 20 and 19% of the population over the age of 40 in urban areas [8]. A previous study reported the overall prevalence of pre-diabetes to diabetes in Nepal to be 9.2% and 8.5% respectively [9]. Just half of the diabetes patients were aware of their condition, and only a third of those on medication had their blood sugar under control [9].

One of the most important aspects of healthcare quality is adherence to prescribed drugs, which itself is defined as the amount to which patients take prescriptions medicines as recommended by their Practitioners [10]. Because non-adherence patients are more likely to develop problems that impair their health status and general quality of life, medication adherence has substantial economic and therapeutic repercussions [11,12]. Though medication adherence is

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one of the primary factors for the betterment of the patient, only 50% of patients with chronic diseases adhere to treatment [13]. The disease burden of T2DM is rising due to medication non-adherence which directly influences poor health outcomes, increased health care costs, and increased comorbidity and mortality [7,12].

In clinical practice, it is still necessary to examine the potential causes of non-adherence among diabetic patients regularly. This is particularly significant in developing nations like Nepal, where economic instability and limited access to healthcare facilities may have contributed to a rise in drug non-adherence. There hasn't been much research on medication adherence among diabetes patients in Nepal. Non-adherence to diabetes medication has been reported in previous research to be as high as (29 percent -71 percent) [14-18]. In addition to this, many studies have reported the role of different factors as predictors of medication adherence such as patient characteristics, the complexity of the therapeutic regimen, and characteristics of health care systems [3,16]. In developed countries, considerable adherence studies in chronic illnesses are conducted, but Nepalese data in this field is lacking. Therefore, this study is performed to assess the incidence of non-adherence to antidiabetic medicines in a Nepalese tertiary hospital, as well as its association with patient demographic factors relevant to the Nepalese context.

Material and Method

Study design, period, and area

From the 22nd of December 2020 to the 23rd of March 2021, hospital-based cross-sectional research was performed at Tertiary care hospital (Tribhuvan University Teaching Hospital (TUTH), Maharajgunj, Kathmandu, Nepal) located in Province 3 Nepal. TUTH, which is located in Kathmandu district, Nepal's capital and biggest metropolitan city, has been offering the most modern tertiary health care services with 700 beds and more than 2000 outside patients benefiting every day [19]. It is one of the most densely inhabited districts in the country, with a total area of 395 km2 [20]. TUTH was chosen for research based on this information.

Population and eligibility criteria

The study participants were the patients diagnosed with type-2 Diabetes Mellitus attending the outpatient department of TUTH. Out-patients consented to participate in the study and those who were on prescription medications for T2DM (> 3 months) were included in the study. This research excluded patients under the age of 25, those who were severely ill, and those who had T1DM or gestational diabetes.

Sample size determination and sampling techniques

In a study performed in Nepal by Gyawali et al. Trials (2018), the overall prevalence of type-2 diabetes mellitus was 11.7 percent (95 percent CI: 10.5–13.1) [21] and the sample size was determined using the prevalence-based formula as used by Al Qarni et al (2019) [22].

$n = Z2p (1-p)/d2$

The symbol (n) is the sample size, (P=11.7% or 0.117) is the prevalence, (Z= the normal deviate i.e. 1.96 resembling to the 95% confidence level) denotes confidence level and (d=5% or 0.05) is precision.

$n = 1.9620.117(1-0.117)/0.052$

$n = 159$

Adding, 10% as the non-response rate, the final sample size after was 175. After constructing a sampling frame (using patient medical registration number) of the Diabetes patients registered in the outpatient department throughout the study period, individual patients were selected for data collection using a systematic random selection approach. The first patient was chosen at random on each research day, and every third patient who met the inclusion criteria was enrolled in the study.

Study variables

Dependent variables: Medication non-adherence

Independent variables: Socio-demographic Factors (Age, Gender, Education level, Employment status, Monthly income, Alcohol consumption, Smoking)

Type of medication

Duration of diabetes mellitus

Presence of diabetic complications

Number of prescribed drug

Data collection instrument and procedure

The instrument for data collection was a structured questionnaire which was divided into two sections; the first section obtained information on socio-demographic data including age, gender, occupation, educational status, alcohol consumption, and smoking behavior as well as clinical characteristics of the respondents and the second section measures the extent to which patients take their medications as prescribed by using 4-item Morisky medication adherence scale (MMAS) [23].

In the four questions with 'yes' or 'no' answers, each 'yes' response was given a score of 1 and each 'no' response was given a score of 0. According to the Morisky classification, adherence is divided into high for those scoring zero, medium for those scoring one or two, and low for those scoring three or four. Morisky adherence is part of the WHO case management adherence guideline (CMAG) assessment tool [13] commonly to assess patients' adherence to existing therapy. Morisky adherence scale has shown to have good validity, with Cronbach α of 0.61 for internal consistency [23]. For the present analysis, the number of patients who showed low adherence was very low, and therefore we divided patients into two groups: adherent group (MMAS score = 0) and non-adherent group (MMAS score = 1, 2, 3, and 4). The questionnaire used in this study was devised after reviewing previous similar studies [16,22,24-28]. The questions used were translated and explained to the patients in the Nepali language.

Because of its convenience, financial feasibility, and as one of the most helpful tools in clinical settings, we assessed medication non-adherence in T2DM patients using Morisky's Medication Adherence Scale (MMAS) in this study [16,23].

Data management and analysis

The collected data were sorted, coded, and entered into Statistical Package for Social Sciences (SPSS) version 26(SPSS Inc, Chicago, Illinois) software and Microsoft Excel 2017 for analysis. Descriptive statics was generated to summarize patient socio-demographic and clinical characteristics data and to determine the level of medications adherence. Associations between two categorical variables were tested using Pearson's chi-square test. The crude odds ratio (COR), adjusted odds ratio (AOR), and 95% confidence interval (CI) were obtained using binary logistic regression to determine the predictors

of medications adherence, and a p-value less than 0.05 was considered statistically significant.

Ethical concerns

The study was conducted after approval from the Institutional Review Committee of the Institute of Medicine (Reference no. 218(6-11) E2/077/78). The patient's medical history was collected only after getting the patients' consent. The study's aim was explained to all participants, and their freedom to reject was respected. Ethical conduct was maintained during data collection and throughout- out the research process. Written and verbal consent was obtained from each patient before the interview. Patients were assured of their anonymity. The confidentiality of the data obtained was assured and the name and address of the patient were omitted from the questionnaire.

Result

Altogether 175 patients who met inclusions criteria were enrolled in the study. The study patients were interviewed about demographic-clinical characteristics and adherence questionnaire.

Socio-demographic characteristics of study patients

The mean age of the patients was 52.5 years (SD=11.9). Among these patients, the greatest number were in the age group 50 years or above i.e.111 (63.4%), followed by the age group 40 years or below i.e. 45(25.7%). This result shows that the prevalence of diabetes mellitus is among the elderly population, rather than the middle-aged population. More than fifty percent i.e. 54.9% of the study population were female followed by 45.1% of males. The majority of the patient had education status below SEE or SEE-62.3%, while other education statuses were Intermediate-20% and Bachelor and above-17.7%. More than fifty percent i.e. 64% of the study population were working followed by 36% of non-working. Similarly, 44.6% of study populations had a monthly income below NPR 20k, 35.4% had monthly income NPR 20-40k and 20% had monthly income above NPR 40k. In the same way, 69.7% of study populations had a family history of diabetes and 54.3% of study populations were consuming alcohol while 58.3% were smokers.

Clinical and medication characteristics of patients

This study showed that the duration of diabetes mellitus was more in ≥10years in most of the patients – 38.3% followed by 5-10 years among 36.6% and ≤ 5 years among 13.7%. More than fifty percent i.e. 69.7% of the study population had a diabetic complication. Among the patients enrolled for this study, 37.1% were taking only oral medication while an equal number of patients i.e.31.1% were on only insulin and both medication for diabetes mellitus. From this study, it can be seen that the majority of patients were taking more than or equal to 3 drugs (52.6%) while 47.4% were taking less than 3 drugs.

Medication adherence behavior of study participants as determined by the Morisky 4-Item Medication Adherence Scale (MMAS-4)

From the 175 patients with diabetes, when asked about adherence to their medications as per Morisky's four-item method, 43(24.6%) of them forget to take the drugs, 38 (21.7%) of patients reported that they had been being careless in taking their medication, 59 (33.7%) patients stop medications when they felt better and the other 41 (23.4%) patients reported that they stop medications when they felt worse while taking medications.

Less than fifty percent of patients 61 (34.1%) were considered highly adherent (MMAS = 0), 97 (55.4%) were medium adherent (MMAS = 1–2), and only seventeen 17(9.7%) had low adherence (MMAS=3-4) (Table 1).

Since the number of patients who showed low adherence was very low, and therefore we divided patients into two groups: adherent group (MMAS score = 0) and non-adherent group (MMAS score = 1, 2, 3, and 4) (Table 2). depicts that among 175 participants, more than half (65.1%) of the participants were non-adherent to medication while only 34.9% were adherent.

Independent factors associated with medications non-adherence

At crude analysis using the bivariate analysis of independent variables; age group, educational status, employment status, monthly income were statistically significant at p-value <0.5 whereas gender, family history of diabetes, alcohol consumption and smoking habits were non-significant in Table 3. Similarly, duration of diabetes, presence of complication, types of the antidiabetic agent were significant at p-value <0.5 while the number of prescribed drugs shows non-significant in Table 4 .Factors shown to be statistically significant in the bivariate analysis were included in the multiple logistic regression analysis, with the relationships reflected by AORs (95% CIs). A p-value of <0.05 was considered statistically significant (Table 5).

Multivariable logistic regression analysis for independent variables to predict non-adherence

From multivariate logistic regression, variables that were significantly associated with non-adherence to DM drugs were Age Group ≥50 (AOR=22, 95%CI: 4.4-112, p <0.01) , education level below SEE or SEE (AOR=24, 95%CI: 4.3-138, p < 0.001) , monthly income ≤ NRs.2000 (AOR=13, 95%CI:2.4-78.6, p<0.04) , Working group (AOR=8.2, 95%CI:1.6-42.5, p<0.012) , duration of diabetes mellitus ≥10 years (AOR=45, 95%CI:6.1-327, p<0.001) , Presence of diabetic complications (AOR=5.2, 95%CI: 1.2-22.8, p<0.025) (Table 5).

Four-question patient questionnaire (Morisky's instrument)	No. of patients who answered yes (%)
Did you ever forget to take your medication?	43(24.6)
Were you careless at times about taking your medication?	38(21.7)
When you felt better, did you sometimes stop taking your medication?	59(33.7)
Sometimes, if you felt worse when you took your medicine did you stop taking it?	41(23.4)
Distribution of score (MMAS score)	**Frequency (n=175, %)**
0	61(34.9)
1	66(37.7)
2	30(17.1)
3	15(8.6)
4	2(1.1)
Adherence level	**Frequency (n=175, %)**
High adherence (MMAS score=0)	61(34.9)
Medium adherence (MMAS score=1-2)	97(55.4)
Low adherence (MMAS score=3-4)	17(9.7)

Table 1: Medication adherence behavior of study participants as determined by the Morisky 4-Item Medication Adherence Scale (MMAS-4) (n=175).

Table 2: Overall medication adherence.

Overall medication adherence	Frequency (n=175, %)
Adherent (MMAS score=0)	61(34.9)
Non-adherent (MMAS score=1,2,3,4)	114(65.1)

Variables	Frequency (n=175, %)	Non-adherent (n=114, %)	Adherent (n=61, %)	Crude Odds Ratio (COR) (95% CI)	P-value
Gender					0.42
Male	79(45.1)	54(47.4)	25(41)	Reference	
Female	96(54.9)	60(52.6)	36(59)	1.29(0.69-2.43)	0.419
Age group (in years)					0.001**
≤40	45(25.7)	9(7.9)	36(59)	Reference	
41-50	19(10.9)	14(12.3)	5(8.2)	11.2(3.19-39.31)	0.001**
≥50	111(63.4)	91(79.8)	20(32.8)	18.2(7.57-43.71)	0.001**
Education level					0.001**
Under SEE or SEE	109(62.3)	90(78.9)	19(31.1)	16.24(6.12-43.12)	0.001**
Intermediate	35(20)	17(14.9)	18(29.5)	3.24(1.12-9.46)	0.032*
Bachelor and above	31(17.7)	7(6.1)	24(39.3)	Reference	
Employment status					0.003**
Working	112(64)	82(71.9)	30(49.2)	2.65(1.39-5.06)	0.003**
Not working	63(36)	32(28.1)	31(50.8)	Reference	
Monthly income (k=NPR 1000)					0.001**
≤20k	78(44.6)	68(59.6)	10(16.4)	23(8.19-64.35)	0.001**
20-40k	62(35.4)	38(33.3)	24(39.3)	5.3(2.1-13.7)	0.001**
≥40k	35(20)	8(7)	27(44.3)	Reference	
Family history of diabetes					0.870
Yes	122(69.7)	79(69.3)	43(70.5)	0.95(0.5-1.86)	0.870
No	53(30.3)	35(30.7)	18(29.5)	Reference	
Alcohol consumption					0.191
Yes	95(54.3)	66(57.9)	29(47.5)	1.5(0.81-2.8)	0.191
No	80(45.7)	48(42.1)	32(52.5)	Reference	
Smoking					0.858
Non-Smoker	73(41.7)	47(41.2)	26(42.6)	Reference	
Smoker	102(58.3)	67(58.8)	35(57.4)	1.1(0.56-1.9)	0.858
Notes: *Statistically significant at p < 0.05, **statistically significant at p < 0.01, CI (confidence interval)					

Table 3: Association between sociodemographic variables and non-adherence, using bivariate analysis (n=175).

Variables	Frequency (n=175, %)	Non-adherent (n=114, %)	Adherent (n=61, %)	Crude Odds Ratio (COR) (95% CI)	P-value
Duration of diabetes mellitus (in year)					0.001**
≤5	44(25.1)	9(7.9)	35(57.4)	Reference	
5-10	64(36.6)	46(40.4)	18(29.5)	9.9(3.9-24.7)	0.001**
≥10	67(38.3)	59(51.1)	8(13.1)	28.7(10.1-81.2)	0.001**
Presence of diabetic complication					0.001**
Yes	122(69.7)	97(85.1)	25(41)	8.2(3.9-16.9)	0.001**
No	53(30.3)	17(14.9)	36(59)	Reference	
Types of antidiabetic agents					0.019*
Oral antidiabetic agents	65(37.1)	34(29.8)	31(50.8)	Reference	
Insulin	55(31.4)	38(38.3)	17(27.9)	2(0.96-4.32)	0.063
Oral antidiabetic agents + Insulin	55(31.4)	42(36.8)	13(21.3)	2.9(1.3-6.5)	0.007**
Number of prescribed medications					0.196
<3	83(47.4)	50(43.9)	33(54.1)	Reference	
≥3	92(52.6)	64(56.1)	28(45.9)	1.5(0.8-2.82)	0.197
Notes: *Statistically significant at p < 0.05, **statistically significant at p < 0.01, CI (confidence interval)					

Table 4: Association between clinical and medication variables and non-adherence, using bivariate analysis (n=175).

Discussion

The study measures medication non-adherence and its associated risk factors with type-2 diabetes mellitus outpatients at tertiary care hospitals. We found that 65.1% were non-adherence to medications. In other studies of Nepal, a similar prevalence of medication non-adherence 69.2%, 55.14% were reported [18,29]. Compared with other countries (31% to 67%), medication non adherence of patients with diabetes were 67.9% in Saudi Arabia [17], 57.7% in India [30], 54.5% in Kenya [31], 50% in Spain [32], 42% in US general population [15], 31.2% to 43.8% in Ethiopia [33,34] and 42% in Palestine [16]. It implies that medication adherence was found to be varied. Similarly, medication adherence in hypertension patients was also found to be varied from 20% to 80% [35]. The causes for these disparities in adherence rates

Factors associated with non-adherence	Frequency (n=175, %)	Non-adherent (n=114, %)	Crude Odds Ratio (COR) (95% CI)	P-value	Adjusted Odds Ratio (AOR) (95% CI)	Adjusted P-value
Age group (in year)				0.001**		0.001**
≤40	45(25.7)	9(7.9)	Reference		Reference	
41-50	19(10.9)	14(12.3)	11(3.2-39.3)	0.001**	12(1.5-98.2)	0.05*
≥50	111(63.4)	91(79.8)	18.2(7.6-43)	0.001**	22(4.4-112)	0.001**
Education level				0.001**		0.002**
Under SEE or SEE	109(62.3)	90(78.9)	16(6.12-43.1)	0.001**	24(4.3-138)	0.001**
Intermediate	35(20)	17(14.9)	3.24(1.1-9.5)	0.032*	9.2(1.1-76)	0.041*
Bachelor and above	31(17.7)	7(6.1)	Reference		Reference	
Employment status				0.003**		
Working	112(64)	82(71.9)	2.65(1.4-5.1)	0.003**	8.2(1.6-42.5)	0.012*
Not working	63(36)	32(28.1)	Reference		Reference	
Monthly income (k=NRs1000)						0.013*
≤20k	78(44.6)	68(59.6)	23(8.2-64.4)	0.001**	13(2.4-78.6)	0.04*
20-40k	62(35.4)	38(33.3)	5.3(2.1-13.7)		6(1.229.4)	0.026*
≥40k	35(20)	8(7)	Reference		Reference	
Types of antidiabetic agents				0.019		0.52
Oral antidiabetic agents	65(37.1)	34(29.8)	Reference		Reference	
Insulin	55(31.4)	38(38.3)	2(0.96-4.32)	0.063	1.2(0.3-5.4)	0.774
Oral antidiabetic agents + Insulin	55(31.4)	42(36.8)	2.9(1.3-6.5)	0.007**	3.(0.5-13.6)	0.255
Duration of diabetes mellitus (in year)				0.001**		0.001*
≤5	44(25.1)	9(7.9)	Reference		Reference	
5-10	64(36.6)	46(40.4)	9.9(3.9-24.7)	0.001**	8(1.9-35.5)	0.06*
≥10	67(38.3)	59(51.1)	28.7(10.1-81.2)	0.001**	45(6.1-327.1)	0.001**
Presence of diabetic complication				0.001**		
Yes	122(69.7)	97(85.1)	8.2(3.9-16.9)	0.001**	5.2(1.2-22.8)	0.025*
No	53(30.3)	17(14.9)	Reference		Reference	
Notes: *Statistically significant at p < 0.05, **statistically significant at p < 0.01, CI (confidence interval)						

Table 5: Multivariable logistic regression analysis to predict non-adherence (n=175).

Abbreviations: C.I, Confidence Interval; IRC, Institutional Review Committee; MMAS, Morisky Medication Adherence Scale; OHA, Oral hypoglycemic Agents; OPD, Out-patient Department; C.O.R, Crude Odds Ratio; AOR, Adjusted Odds Ratio; SPSS, Statistical Package for Social Sciences; T2DM, Type 2 Diabetes Mellitus; TUTH, Tribhuvan University Teaching Hospital; MA, Medication Adherence ; NPR, Nepalese Rupee; SEE, Secondary Education Examination.

are likely impacted by factors other than socio demographic or clinical characteristics [36] and no one technique of medication adherence evaluation scale has been proved to be better or highly effective [37].

Multiple logistic regression analysis revealed that study patients over 50 years were 22 times more likely than those aged 40 years to fail to adhere to their treatments (AOR=22, 95 percent CI: 4.4-112). This finding was in line with prior research studies [38,39]. The high rate of medication non-adherence in older people might be attributed to forgetfulness, which leads to the omission of drugs, increased risk of side effects, physical inability, financial constraints [40], and a lack of functional health literacy. The ability to read, comprehend, and act on health information is characterized as functional health literacy [41]. However, other studies have found that medication adherence increases with age as people become more conscious of their treatments [15,22]. Furthermore, some research shows that age has a concave effect on medication adherence, with poorer adherence in younger age groups, rising adherence with a peak in medium to senior age groups, and decreased adherence in very old age groups [42].

This study shows the study participants with an education level below SEE or SEE were 24 times more likely to non-adherence with their therapies as compared to bachelors or above level (AOR=24, 95%CI:4.3-138) and monthly income ≤ NRs.2000 13 times more likely to non-adherence with their therapies as compared to monthly income ≥ NRs.4000 (AOR=13, 95%CI:2.4-78.6). It implies that medication non-adherence increase with low literacy rates and low monthly income. This finding was in concordance with previous studies [23,27,43-45]. Poor economic status and low literacy may contribute to poor diabetes outcomes owing to limited access to healthcare services and diabetes self-care. Patients who were more educated were more likely to stick to their treatment plans. Learning becomes more difficult when a person is less educated; as diabetic drug therapy becomes more complicated, patients are expected to have increasingly complex cognitive abilities to understand and adhere to the prescribed drug therapy for excellent glucose control [46,47]. Changing health facilities and contemplating medicine subsidies for these persons may be able to overcome the financial barrier to medication non-adherence [47]. In contrast, other research has shown no link between medication adherence and education [48] or economic level, claiming that other variables such as social, cultural, medical insurance and personal characteristics may affect a patient's medicine-taking habits [22].

According to this study, study patients in the working group were 8.2 times more likely to fail to take their medications than those in the non-working group (AOR=8.2, 95 percent CI:1.6-42.5), which is consistent with a previous study conducted in France that found that patients in the working group are more likely to forget to take their medications [2]. However, a study of hypertension individuals found that non-working persons had poor medication adherence due to limited access to healthcare and limited financial means [47]. While some studies claim there is no link between work and MA [48].

Medication non-adherence was 45 times more probable in study participants with diabetes mellitus for more than 10 years compared to individuals with diabetes mellitus for less than 5 years (AOR=45, 95

percent CI:6.1-327.1), which was consistent with prior research [44]. Patients are more dedicated to their condition in the early stages of the disease, but this dedication does not endure long as they adjust to the burden and the disease progresses. While some research has shown that a high MA in a patient with a lengthy history of hypertension can be attributed to a high level of knowledge and expertise with the issue, a good doctor-patient connection, and high trust in the doctor's recommendations [47,49]. Some research, on the other hand, found no link between MA and diabetes duration [3,48].

The presence of diabetic complications in study patients was associated with a 5.2 times higher likelihood of non-adherence than the patients who did not have any diabetic complications (AOR=5.2, 95 percent CI: 1.2-22.8), which was consistent with the findings of Simpson et al., who found that good MA was associated with a low risk of diabetic complications [50], despite some studies claiming that there was no link between MA and adherence [51].

Even though types of anti-diabetic drugs had a significant association with medication non-adherence (COR=2.9, 95 percent CI:1.3-6.5) on uni variate analysis, when conducted in multiple logistic regression analysis, the relationship was non-significant (adjusted p-value >0.255, 95 percent CI: 0.5-13.6). This means that when other independent parameters such as kinds of anti-diabetic medications, such as oral agents only, insulin only, or both, were compared to oral agents only, no association was found.

The total number of anti-diabetic drugs had a non-significant relationship with medication non-adherence, which was consistent with a study by Lee et al., who found that the total number of regular medications (OHA-Oral Hypoglycemic Agents and other long-term medications) consumed daily did not appear to affect medication adherence (MA) to OHA [51]. Grant et colleagues also discovered no link between the number of medicines taken and MA [52]. Paes et al. found that once-daily regimens resulted in greater MA than twice-daily regimens [53].

Similarly, in this cross-sectional investigation, there was no significant association between medication non-adherence and family history of diabetes, alcohol use, or smoking behaviors. To determine such a connection, a longitudinal study design would be preferable.

Conclusion

Non-adherence to medicines was found to be 65.1% among T2DM patients. Adjusting all of the related independent factors, such as age, education level, job status, monthly income, diabetes duration, and the existence of diabetic problems, it revealed a significant relationship between medication non-adherence and the occurrence of diabetic complications. The variables that predict diabetes medication non-adherence aid in the creation and assessment of interventions to improve medication adherence. Overall, the results of this study showed that medication non-adherence is significant among T2DM outpatients in a tertiary healthcare setting.

Strength and Limitations of the Study

The 4-item Morisky Medications Adherence Scale, which is part of the WHO case management adherence guideline (CMAG) and is frequently used to measure patient adherence to current medication, was utilized in this investigation. Despite its limitations, this study contributes to the field by providing useful information on medication non-adherence and its related risk factors.

As this study was single-centered, its generalizability may be limited. Since the study was cross-sectional, the causal link between the predictor factors and the outcome variables could not be established completely. Some limitations were a lack of comprehensive information on adherence to other parts of the diabetes treatment plan, notably nutritional adherence, and the frequency with which patients self-monitored their blood glucose levels.

Recommendations

In this study, the percentage of medication non-adherence was 65.1 percent. Future large-scale research is needed to better understand the problem and devise more effective solutions, as this is a tiny cross-sectional study. Patients should be encouraged to take anti-diabetic medications as prescribed and frequent awareness of the benefits of doing so should be fostered to prevent non-adherence. A further qualitative study on patient behavior toward medicine intake is needed to have a better knowledge of the specific variables that may cause non-adherence in this population.

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Author Contributions

All authors contributed significantly to the conception and design, data acquisition, or data analysis and interpretation; participated in the drafting of the article or critically revised it for important intellectual content; agreed to submit the article to the current journal; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work.

Data Sharing Statement

The data used and analyzed in this study are available from the corresponding author on reasonable request.

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The author reports no conflicts of interest in this work.

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