Prevalence and Factors Associated with Medication Non-Adherence Among Diabetic Patients in Menoufia Governorate

Original Article

Moustafa Bakrey Hamed Ata[1], Zeinab Abdel Aziz Kasemy[2], Mohamed Fahmy Amara[3], Ahmed Mohammed Zahran[1] and Shimaa Kamal El Din Zewain[1].

[1]Department of Internal Medicine, [2]Public Health and Community Medicine Department, Faculty of Medicine, Menoufia University, Egypt.

[3]Department of Internal Medicine, Faculty of Medicine, Fayoum University, Fayoum, Egypt.

ABSTRACT

Background: Treatment non-adherence is a common and important problem in diabetes care that negatively impacts treatment outcomes. Therefore, we should exert efforts to understand the magnitude of the problem and begin solving it.

Objectives: To determine how medication adherence differs between patients with type 2 diabetes mellitus (T2DM) and to clarify factors that contribute to medication adherence in this population, and how it affects microvascular complications.

Patients and Methods: A cross-sectional study conducted on 570 diabetic patients using a structured questionnaire for face-to-face interview at endocrinology outpatient clinics and inpatient wards at Menoufia university hospitals in the period between December 2021 and December 2023. Full history, examination and biochemical profile were obtained and state of medication adherence was assessed using Morisky Medication Adherence Scale (MMAS).

Results: the prevalence of non-medication adherence in the study was 62.8%. educational level, family income, duration of Diabetes, use of insulin were identified as risk factors for poor medications adherence (*p value* <0.001). However, age, gender, presence of other comorbidities wasn't significant among studied patients (*p value* 0.638 ,0.136 and 0.520 respectively).

Conclusion: Low income, low educational level, long duration of diabetes and use of insulin contribute to the high prevalence of medication non-adherence among diabetic patients, which in turn is responsible for the severity of microvascular complications.

Key Words: Diabetes mellitus; medication adherence; risk factors.

Received: 24 May 2024, **Accepted:** 21 July 2024

Corresponding Author: Moustafa Bakrey Hamed Ata, Department of internal medicine, Faculty of Medicine, Menoufia university, Egypt, **Tel.:** +201006965686, **E-mail**: dr.moustafabakrey@gmail.com orcid number (0009_0002_8450_438x).

ISSN: 2735-3540, vol. 75, No. 3, September 2024.

INTRODUCTION

The International Diabetes Federation (IDF) found Egypt among top 10 countries in diabetes prevalence. It is expected that the number of diabetic patients in the Middle East and North Africa (MENA) region to increase from 34.6 million to 67.9 million[1]. Treatment non-adherence is a common and vital issue in diabetes care that adversely impacts treatment sequel[2].

Good adherence to pharmacological treatment is linked to lower hospitalization rate and all-cause mortality among individuals with T2DM, as evidenced by meta-analysis data[3].

Non-adherence to medication is a complex observable process and is troubled by many factors such as patients' features, doctor-patient interaction and healthcare system[4].

Assessing and quantifying non-adherence is a challenge. Although many methods have been created to enhance adherence, there is currently no single gold standard and no clear guidelines for defining and identifying non-adherence[5].

Measurement of medication adherence can be classified into two categories: direct and indirect. Direct methods involve promptly observing treatment and oversight unique drug metabolites or specific markers and

DOI: 10.21608/ASMJ.2024.292211.1277

considered more precise than indirect methods, however they are little expensive and cannot be used routinely in daily clinical practice. Indirect methods entail self-reports, patient surveys, diaries, records, electronic medication monitors and patient clinical response[6].

Many studies have found that poor medication adherence is responsible for microvascular and macrovascular complications and disease severity in diabetes[7].

Popular used patient questionnaires for the assessment of medication adherence is the Morisky Medication Adherence Scale (MMAS) by ***Morisky et al.*** which evolved a self-reported scale involving 4 items regarding frequent medication taking behaviors leading to negligence of drug[8].

Fewer studies on antidiabetic medication non-adherence have been conducted. Our study aimed to identify the state of medication adherence among patients with T2DM and to identify factors associated with medication adherence in this population and its relation to microvascular complications.

PATIENTS AND METHODS

Cross-sectional study conducted on 570 diabetic patients selected from endocrinology outpatient clinics and inpatient wards at a tertiary care hospital from December 2021 to December 2023. Patients are classified as: patients with low and moderate medication adherence (Group I); and patients with high medication adherence (Group II).

Type 2 diabetic patients above 18 years of age currently receiving glucose-lowering therapy, gave informed consent were included in our study. They were subdued to full history Including: Sociodemographic characteristics, and medical history including: duration of diabetes, antidiabetic medication, other comorbidities like hypertension cardiovascular diseases renal or hepatic diseases and drug history.

Complete physical examination: Including: body weight, height, Body Mass index (BMI), Waist and hip circumference, waist to hip ratio, blood pressure, pulse and examination of peripheral neuropathy.

Medication adherence was assessed by the MGL scale, it is a 4-item generic, medication-adherence scale developed firstly in 1986 from an original 5-item tool. The scale's design eases problems identification to assess adequate adherence. Lower scores indicate good adherence and patients' scores can be classified into high adherence level (0 item answered "yes"), moderate adherence level (1–2 items answered "yes") and low level of adherence (3–4 items answered "yes")

Also patients were biochemically investigated by Fasting blood sugar (FBS), 2h post prandial (2Hpp), glycated hemoglobin (HbA1C), Kidney function test (KFTS), protein/create ratio, lipid profile, complete blood count (CBC) and Mean platelet volume (MPV), liver enzymes, serum albumin.

Ethical Considerations and consent to participate: This study was approved by Institutional Review Boards (IRB) of the Menoufia faculty of medicine, Egypt, with approval code (11/2022INT28-1) in November 2022. An informed consent was taken in which each participant has been informed of all aspects of the study and have the right to give up as he wanted.

Statistical analysis

Results analyzed by an IBM compatible personal computer with SPSS statistical package version 23. Chi-squared test ($\chi 2$) used to find association between two or more qualitative variables. Fischer exact test: for 2 x 2 tables when expected cell count of more than 25% of cases was less than 5 and *p-value* < 0.05 was considered significant, Student t-test used for comparison between two groups having quantitative variables and with independent parametric data, Mann-whiteny test used for comparison between two groups having quantitative variables and with independent non parametric data, Regression analysis used for estimating the relationships among variables.

RESULTS

The current study was carried out enrolling 570 diabetic patients with an overall response rate of 96.4%. Patients were classified according adherence as Group 1 included 358 low and moderate medication adherent diabetic patients while group II included 212 high medications adherent.

There was large incidence of reluctance between the studied groups as regards taking medication (39%) or forgetting medication (40%). Not only, (36%) of patients stop their regular diabetic medication, but also (28%) feel better when stop them. Over all, medication adherence was low between studied groups 1 and 2 (62.8%, 37.2%) respectively (Table 1). This reflect more upcoming incidence of diabetic morbidity and mortality and necessitate health education effective role for diabetics

Comparing low & moderate medication adherent group with high adherent group demographically revealed a highly significant difference between two groups regarding

educational level and family income (p<0.001), being higher in high medication adherent than other group (Table 2).

As regard diabetes duration, a highly significant statistical difference was present, longer duration in low & moderate adherence group (10.43±6.51) than high adherence group (7.68±4.99). As regard anti diabetic drugs, number of patients using insulin was significantly higher in low to and moderate group adherence (49.4%) than high adherent group (34%) (Table 3).

As regard BMI, increased body weight in high adherence group (29.58±5.89) was more prevalent than low & moderate adherence group (28.4±4.14). Prevalence of peripheral neuropathy was highly significant difference (p<0.001) being higher in low adherent group than high adherent group (Table 4).

As regard FBS, 2HPP, HbA1c they were significantly higher in low medication adherent group than high adherent group (p<0.001), as regard assessing lipid parameters as blood cholesterol, serum triglycerides, LDL-c they were significantly high-up in low adherent group than high group. as regard protein \creatinine ratio it was significantly higher in low adherent group than high adherent group (p<0.001) (Table 5).

Table 1: Morisky Medication Adherence Scale for drug adherence among studied patients (no=570).

	No (%)
Do you ever forget to take your medicine?	
Yes	228(40%)
No	342(60%)
Are you careless at times about taking your medicine?	
Yes	223(39.1%)
No	347(60.9%)
When you feel better do you sometimes stop taking your medicine	
Yes	205(36%)
No	365(64%)
Sometimes if you feel worse when you take the medicine do you stop taking it	
Yes	164(28.8%)
No	405(70.2%
Degree of adherence	
Low and moderate	358(62.8%)
High	212(37.2%)

Table 2: Comparison of demographic data of studied patients as regard medication adherence (no=570).

	(low and moderate medicine adherence) No=358	(high medicine adherence) No=212	Test of significant	*P value*
Age			t	
X±SD	56.72±11.25	56.37±13.19		0.638
Range	39-85	36-89	0.471	
Median	57	58		
Gender				
Female	221(61.7%)	144(67.9%)	χ2	0.136
Male	137(38.3%)	68(32.1%)	2.21	
Residence				
Rural	245(68.4%)	121(57.1%)	χ2	0.007*
Urban	113(31.6%)	91(42.9%)	7.47	
Material status				
Single	16(4.5%)	13(6.1%)	χ2	0.683
Married	284(79.3%)	165(77.8%)	0.764	
Widow	58(16.2%)	34(16%)		
Employment				0.039
Working	134(37.4%)	98(46.2%)	χ2	
Not working	224(62.6%)	114(53.8%)	4.26	
Education level				<0.001*
Illiterate, read only	140(39.1%)	47(22.2%)	FET	
Basic	21(5.9%)	4(1.9%)		
Secondary	97(27.1%)	51(24.1%)	37.9	
University	99(27.7%)	108(50.8%)		
Post graduate	1(0.3%)	2(0.9%)		
Number of family member				0.205
≤ 4	89(24.9%)	63(29.7%)	χ2	
> 4	269(75.1%)	149(70.3%)	1.60	
Family income				<0.001*
Low	119(33.2%)	29(13.7%)	χ2	
Average	200(55.9%)	123(58%)	43.5	
High	39(10.9%)	60(28.3%)		

t=students t test; χ2 =chiq-square test; FET=fishers exact test; *=significant.

Table 3: Comparison of medical history as regard medicine adherence (no=570).

	(low and moderate medicine adherence) No=358	(high medicine adherence) No=212	Test of significant	*P value*
Duration of DM			U	
X±SD	10.43±6.51	7.68±4.99		<0.001*
Range	0.3-33	1-24	5.06	
Median	9	7		
Anti DM treatment				<0.001*
OHD	181(50.6%)	140(66%)	χ2	
Insulin	177(49.4%)	72(34%)	12.9	
Co morbidities				0.520
Yes	251(70.1%)	154(72.6%)	χ2	
No	107(29.9%)	58(27.4%)	0.414	
Other medication				0.330
Yes	236(65.9%)	131(61.8%)	χ2	
No	122(34.1%)	81(38.2%)	0.990	
Family history of DM				0.290
Negative	126(35.2%)	84(39.6%)	χ2	
Positive	232(64.8%)	128(60.4%)	1.12	

t=students t test; χ2 =chi-square test; *=significant.

Table 4: Comparison of Anthropometric measurement and clinical data as regard medicine adherence (no=570).

	(low and moderate medicine adherence) No=358	(high medicine adherence) No=212	t Test	*P value*
BMI (kg/m^2)				0.047*
X±SD	28.4±4.14	29.58±5.89		
Range	-40.420.4	21.3-48.4	2.40	
Median	27.6	28		
Waist circumference (cm)				0.052
X±SD	105.1±14.1	107.7±15.5		
Range	73-150	75-157	1.95	
Median	105	107		
Hip circumference (cm)				0.196
X±SD	121.2±14.3	123.1±16.2		
Range	88-170	87-175	1.39	
Median	123	122		
Waist hip ratio				0.070
X±SD	0.863±0.044	0.871±0.051		
Range	0.73-0.96	0.73-1.05	1.81	
Median	0.86	0.86		
SBP(mmHg)				0.327
X±SD	124.06±17.40	122.55±17.75		
Range	90-180	90-160	0.982	
Median	120	120		
DBP(mmHg)				0.490
X±SD	83.80±12.96	80.91±12.31		
Range	50-110	50-110	0.691	
Median	80	80		
Heart rate(beat/minute)				0.007*
X±SD	79.35±14.27	80.16±12.98		
Range	60-110	62-120	2.65	
Median	87	77		
Peripheral Neuropath			U	<0.001*
X±SD	13.26±8.37	5.40±3.45	12.02	
Range	0-32	0-18		
Median	11	5		

t=students t test; U=Mann-Whitney test; *=significant; BMI=body mass index;
SBP=systolic blood pressure; DBP=diastolic blood pressure.

Table 5: Comparison of laboratory investigation in studied patients as regard medicine adherence (no=570).

	(low and moderate medicine adherence) No=358	(high medicine adherence) No=212	t test	*P value*
HB gm/dl				
X±SD	10.52±1.86	10.45±1.83		0.664
Range	6.1-26.3	5.9-15.6	0.435	
Platelets			U	
X±SD	236.80±78.91	247.3±94.7		0.175
Range	55-450	47-450	1.35	
Median	221	224		
MPV				
X±SD	8.19±1.37	8.07±1.61		0.384
Range	5-12.	4.8-12.2	0.872	
FBS (mg/dl)				
X±SD	167.39±45.82	122.86±22.99		<0.001*
Range	90-323	91-210	15.32	
2Hour PPBs (mg/dl)				
X±SD	234.82±61.79	176.76±34.91		<0.001*
Range	123-450	127-280	14.32	
HBAC1%				
X±SD	8.87±1.44	7.27±0.573		<0.001*
Range	6.8-14	5.9-9.3	17.66	
Cholesterol (mg/dl)				
X±SD	201.25±25.73	196.11±27.83		0.029*
Range	144-288	149-290	2.18	
Median	198	190		
Triglycerides (mg/dl)				
X±SD	161.46±12.96	156.59±19.95		0.005*
Range	95-195	97-199	2.82	
Median	165	155		
LDL-c(mg/dl)				
X±SD	167.32±14.27	155.50±32.92		<0.001*
Range	66-225	55-213	4.32	
Median	169.5	158		
HDL-c (mg/dl)				
X±SD	35.70±8.48	36.52±8.83		0.278
Range	19-65	19-64	1.08	
Median	34	35		
AST (U/L)			U	
X±SD	35.83±16.03	33.34±16.04		0.036*
Range	11-99	9-98	2.09	
Median	33	31		
ALT(U/L)			U	
X±SD	28.75±14.06	25.94±14.58		0.006*
Range	6-71	3-77	2.76	
Median	28	22		
Albumin			T	
X±SD	3.43±0.483	3.59±0.475		<0.001*
Range	2.5-4.3	2.4-4.6	3.98	
Median	3.34	3.90		
prot/creat ratio			U	
X±SD	441.01±404.4	229.8±240.45		<0.001*
Range	18-2000	12-1200	4.91	
Median	333	178		
Urea mg/dl)			U	
X±SD	53.06±49.33	56.50±63.36		0.176
Range	9-310	11-410	1.35	
Median	33	33		
Creatinine (mg/dl)			U	
X±SD	1.70±1.34	1.97±2.05		0.118
Range	0.7-6.6	0.6-9.1	1.56	
Median	1.10	1.10		
eGFR			U	
X±SD	56.90±28.03	59.30±33.15		0.349
Range	8-123	4-117	0.936	
Median	61	63		
GFR *			2	
<60	125(40.3%)	66(37.4%)	0.421	0.516
>60	185(50.7%)	114(62.6%)		

t=students t test; U=Mann-Whitney test; $\chi 2$=chi-square test; *=significant.
HB=hemoglobin; FBG=fasting blood glucose; 2hpp BG= 2-hour post prandial Blood glucose.
HBA1C=hemoglobin A1c; eGFR=estimated glomerular filtration rate; ALT=Alanine transaminase; AST=aspartate aminotransferase.
MPV=mean platelet volume; HDL-c= high-density lipoprotein cholesterol; LDL-c= low-density lipoprotein) cholesterol.

Binary Logistic Regression analysis for factors affecting diabetes non-adherence showed that decreasing BMI was 1.10 times more likely to show low to moderate adherence while increasing Peripheral neuropathy or HbA1C was connected to increased possibility of reduction in the level of adherence (p=0.001) (Table 6).

Table 6: Binary Logistic Regression for factors associated with diabetes non-adherence among studied patients.

	P value	OR	95% CI	
			Lower Bound	Upper Bound
Residence	0.626	0.88	0.53	1.45
Employment	0.232	0.71	0.41	1.24
Education	0.827	1.03	0.78	1.35
Income	0.029	1.71	1.05	2.79
Duration of disease	0.721	1.01	0.95	1.06
Anti DM treatment	0.302	1.36	0.75	2.46
BMI	0.001*	1.10	1.05	1.61
Peripheral neuropathy	0.001*	0.75	0.70	0.80
FBS	0.887	1.01	0.97	1.03
2 Hour PP	0.377	0.99	0.97	1.01
HbA1C	0.001*	0.17	0.07	0.44
Cholesterol	0.776	0.99	0.96	1.02
Triglyceride	0.151	1.02	0.99	1.01
LDL	0.232	0.98	0.96	1.05
AST	0.503	1.01	0.97	1.04
ALT	0.655	0.99	0.95	1.02
Protein /creatinine ratio	0.992	1.00	0.99	1.0

*: Significant

DISCUSSION

Our study aimed to identify the state of medication adherence among type 2 diabetic patients and to clarify factors associated with medication adherence and its relation to microvascular complications. This will help us in minimizing associated morbidity and mortality.

The American Diabetes Association (ADA) classifies adherence barriers to patient factors, medication barriers, or others system factors. Patient factors entails forget refilling from the physician or to take them from the pharmacy, forget to take or fear of taking medications due to health beliefs regarding them. Medication regimen complexity or multiplicity, cost, and side effects are all common medication factors that leads to non-adherence. System factors include inadequate support and follow-up[9].

We found that prevalence of non-medication cohesion in the study was 62.8%. Also, there was no compelling difference regarding age among adherent group and non-adherent group. in contrast to ***Horii et al.,*** 2019[10] that showed symbolic difference between adherent and non-adherent groups regarding age, also ***Aminde et al.***, 2019[11] showed that participants who were aged more than 60 years (adjusted odds ratio (aOR.) = 0.48; 95% CI: 0.25–0.94, p = 0.02) were more likely to be non-adherent to their antidiabetic medication.

We also found, no significant difference regarding gender among studied groups (*p value* 0.136) that is in agreement with ***Rwegerera 2014***[12] and ***Alminde et al.***, 2019[11].

In our study there was significant difference regarding employment status among studied groups. This finding disagreed with ***Mirghani, 2019***[13] who showed that no differences in medications adherence was evident regarding occupation and employment status.

The study confirms ***Durán et al.***, 2001[14] and ***Kalyango et al.***, 2008[15] studies reporting that adherent patients had higher educational levels than non-adherent patients, but disagrees with ***Mannan et al.***, 2021[16], and this may be due to the higher educational level, the more the awareness about diabetic complications, hence more medication adherence will occur.

We found adherent and non-adherent patients had significantly different family incomes, adherent patients having higher incomes than non-adherent. This result agrees with ***Mannan et al.***, 2021[16] and ***Raum et al.***, 2012[17] Patients' drug-adherence can be explained by if they can afford the cost of medications, they are more likely to be drug-adherent. However, according to ***Osborn et al.***, 2017[18], medication adherence is not related to socioeconomic status.

The duration of DM was longer in non-adherent patients than in adherent, which is consistent with ***Gimenes et al.***, 2009[19]. but disagrees with ***Rwegerera, 2014***[12] Adherence levels to medication did not vary significantly depending

on the diabetes duration or number of antidiabetic drugs taking. However, patients tend to exhibit more adherence in the early years of the disease to maintain normal blood glucose levels and with upcoming years of the disease, the attitude towards the same disease and its medications may be changed, compromising drug compliance.

The type of antidiabetic drugs used by the adherent and non-adherent groups in the current study were significantly different. The non-adherent group had a significantly higher percentage of insulin users than the adherent group. this study agrees with Adisa and ***Fakeye, 2013***[20] who showed that insulin using diabetic patients were less likely to be adherent on their medication and to follow the recommended diets by their physicians compared to those taking oral tablets. Also ***Aminde et al.***, ***2019***[11] reported that insulin users alone were two times being non-adherent compared to participants on oral hypoglycemic agents. This can be explained by many factors including the painful administration of insulin, multiplicity of administration, complexity of regimen, cost of medications and hypoglycemia fears.

In the present study no significant difference regarding comorbidities other than DM and use of other medication other than antidiabetic medications among studied groups. ***Rwegerera, 2014***[12] showed use of other treatment in addition to anti-diabetic drugs was found to have a significant association with good adherence, which may help patients with multiple co-morbidities who attend different clinics.

Also, there were no statiscally significant differences in family history of diabetes mellitus between the adherent and non-adherent groups, which is in agreement with that found by ***Jackson et al.***, ***2015***[21].

As regarding BMI, it was higher in adherent patients than non-adherent patients. This can be explained by some anti-diabetic drugs are lipogenic such as insulin and sulfonylurea. In contrast, ***Rwegerera, 2014***[12] showed that obesity have a deleterious influence on patient's adherence to dietary advice or fear of weight gain associated with medication use. On the other hand, ***Horii et al.***, ***2019***[10] showed no significant difference regarding BMI between adherent patients and non-adherent patients.

Poor medication adherence will lead to poor glycemic control that leads to increased risk of diabetic complications. Peripheral neuropathy score was significantly higher in low adherent patients than high adherent. ***Simpson et al.***, ***2016***[22] showed that good adherence (medication possession ratio ≥0.8) was linked to lower risk of microvascular complication in form of diabetic nephropathy. Also ***Yu et al.***, ***2010***[23] who showed a significant benefit of medication adherence on the reduction of microvascular complications including diabetic nephropathy.

A significant difference regarding indicators of glycemic control (FBS, 2HPP, HbA1C) among adherent group and non-adherent group (p *value* <0.001) was detected where HbA1C, FBS and 2HPP were lower in adherent patients than non-adherent patients. these findings agree with ***Waari et al.***, ***2018***[24] who showed the patients with high MMAS-8 scores meditative good medication adherence were having lower and optimal glycosylated hemoglobin value but ***Rwegerera, 2014***[12] showed that good glycemic controlled patients were caring adherence to anti-diabetic drugs in comparison to those with poor glycemic control, nonetheless; this was not statistically significant. On the other hand, ***Davies et al.***, ***2018***[25] showed a lack of relation between anti-diabetic drug adherence and their glycemic control.

The lipid profile of the non-adherent group was significantly higher than that of the adherent group in our study. that is in agreement agrees with ***Cotta et al.***, 2009[26] but disagrees with ***Grant et al.***, 2003[27] who showed that there is no significant difference regarding lipid profile between studied groups.

Binary Logistic Regression model to ascertain the effects of demographic and laboratory investigations on the likelihood of low to moderate adherence among the studied participants showed decreasing BMI was 1.10 times more likely to show low to moderate adherence while increasing Peripheral neuropathy or HbA1C was associated with an increased possibility of reduction in the level of adherence (p=0.001)

CONCLUSION

Diabetes patients are prone to medication non-adherence, which is a result of low income, low educational level, long diabetes duration, and use of insulin injections. To reduce morbidity and mortalities, all efforts, both governmental and nongovernmental, are needed. The solution to medication non-adherence lies in health education and awareness among DM patients. Further studies are necessary to determine the level of change in medication adherence after conducting health education sessions.

FINANCIAL SPONSORSHIP AND SUPPORT

Nil.

CONFLICT OF INTERESTS

There are no conflicts of interest.

ACKNOWLEDGMENT

All authors have contributed significantly and agree with the content of the manuscript.

REFERENCES

1. **Hegazi R, El-Gamal M, Abdel-Hady N, et al.** Epidemiology of and risk factors for type 2 diabetes in Egypt. Annals of global health. 2015;81(6):814-20.

2. **Polonsky WH, Henry RR.** Poor medication adherence in type 2 diabetes: recognizing the scope of the problem and its key contributors. Patient Prefer Adherence. 2016; 10:1299-1307.

3. **Vlacho B, Mata-Cases M, Mundet-Tudurí X, Vallès-Callol JA, Real J, Farre M, Cos X, Khunti K, Mauricio D, Franch-Nadal J.** Analysis of the Adherence and Safety of Second Oral Glucose-Lowering Therapy in Routine Practice from the Mediterranean Area: A Retrospective Cohort Study. Front Endocrinol (Lausanne). 2021 Jul 14; 12:708372. doi: 10.3389/fendo.2021.708372.

4. **Pourhabibi N, Mohebbi B, Sadeghi R, Shakibazadeh E, Sanjari M, Tol A, Yaseri M.** Determinants of Poor Treatment Adherence among Patients with Type 2 Diabetes and Limited Health Literacy: A Scoping Review. J Diabetes Res. 2022 Jul 4; 2022:2980250. doi: 10.1155/2022/2980250.

5. **Denicolò S, Perco P, Thöni S, Mayer G.** Non-adherence to antidiabetic and cardiovascular drugs in type 2 diabetes mellitus and its association with renal and cardiovascular outcomes: A narrative review. J Diabetes Complications. 2021 Jul;35(7):107931. doi: 10.1016/j.jdiacomp.2021.107931.

6. **Faisal K, Tusiimire J, Yadesa TM.** Prevalence and Factors Associated with Non-Adherence to Antidiabetic Medication Among Patients at Mbarara Regional Referral Hospital, Mbarara, Uganda. Patient Prefer Adherence. 2022 Feb 22; 16:479-491. doi: 10.2147/PPA.S343736.

7. **Chawla A, Chawla R, Jaggi S.** Microvasular and macrovascular complications in diabetes mellitus: Distinct or continuum?. Indian J Endocrinol Metab. 2016;20(4):546-551.

8. **Moon SJ, Lee WY, Hwang JS, Hong YP, Morisky DE.** Accuracy of a screening tool for medication adherence: A systematic review and meta-analysis of the Morisky Medication Adherence Scale-8. PLoS One. 2017 Nov 2;12(11): e0187139. doi: 10.1371/journal.pone.0187139. Erratum in: PLoS One. 2018 Apr 17;13(4): e0196138.

9. **Sarbacker GB, Urteaga EM.** Adherence to Insulin Therapy. Diabetes Spectr. 2016 Aug;29(3):166-70. doi: 10.2337/diaspect.29.3.166. PMID: 27574371; PMCID: PMC5001221.

10. **Horii T, Momo K, Yasu T, et al.** Determination of factors affecting medication adherence in type 2 diabetes mellitus patients using a nationwide claim-based database in Japan. PLoS One. 2019;14(10): e0223431.

11. **Aminde, L.N., Tindong, M., Ngwasiri, C.A. et al.** Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. BMC Endocr Disord 19, 35 (2019). https://doi.org/10.1186/s12902-019-0360-9

12. **Rwegerera GM.** Adherence to anti-diabetic drugs among patients with Type 2 diabetes mellitus at Muhimbili National Hospital, D ar es Salaam, Tanzania- A cross-sectional study. Pan Afr Med J. 2014; 17:252. Published 2014 Apr 7. doi:10.11604/pamj.2014.17.252.2972.

13. **Mirghani HO.** An evaluation of adherence to anti-diabetic medications among type 2 diabetic patients in a Sudanese outpatient clinic. Pan Afr Med J. 2019; 34:34. Published 2019 Sep 16. doi:10.11604/pamj.2019.34.34.15161.

14. **Durán-Varela BR, Rivera-Chavira B, Franco-Gallegos E.** Pharmacological therapy compliance in diabetes. Salud Públ Méx. 2001; 43:233–236.

15. **Kalyango JN, Owino E, Nambuya AP.** Non-adherence to diabetes treatment at Mulago Hospital in Uganda: prevalence and associated factors. Afr Health Sci. 2008; 8:67–73.

16. **Adnan Mannan, Md. Mahbub Hasan, Farhana Akter, Md. Mashud Rana, Nowshad Asgar Chowdhury, Lal B. Rawal & Tuhin Biswas (2021)** Factors associated with low adherence to medication among patients with type 2 diabetes at different healthcare facilities in southern Bangladesh, Global Health Action, 14:1, DOI: 10.1080/16549716.2021.1872895.

17. **Raum E, Krämer HU, Rüter G, et al.** Medication non-adherence and poor glycaemic control in patients with type 2 diabetes mellitus. Diabetes Res Clin Pract. 2012; 97:377–384. [Crossref], [Web of Science ®], [Google Scholar].

18. **Osborn CY, Osborn CY, Kripalani S, et al.** Financial strain is associated with medication nonadherence and worse self-rated health among cardiovascular patients. J Health Care Poor Underserved. 2017;28(1):499-513.

19. **Gimenes HT, Zanetti ML, Haas VJ.** Factors related to patient adherence to antidiabetic drug therapy. Rev Latinoam Enfermagem. 2009;17(1):46–51

20. **Adisa R, Fakeye TO.** Effect of number and type of antidiabetes medications on adherence and glycemia of ambulatory type 2 diabetes patients in southwestern Nigeria. Pharm Pract. 2013;11(3):156. doi:10.4321/S1886-36552013000300006

21. **Jackson IL, Adibe MO, Okonta MJ, Ukwe CV.** Medication adherence in type 2 diabetes patients in Nigeria. Diabetes Technol Ther. 2015 Jun;17(6):398-404. doi: 10.1089/dia.2014.0279. Epub 2015 Mar 6. PMID: 25749392.

22. **Simpson SH, Lin M, Eurich DT.** Medication Adherence Affects Risk of New Diabetes Complications: A Cohort Study. Ann Pharmacother. 2016 Sep;50(9):741-6. doi: 10.1177/1060028016653609. Epub 2016 Jun 15. PMID: 27307411.

23. **Yu AP, Yu YF, Nichol MB.** Estimating the effect of medication adherence on health outcomes among patients with type 2 diabetes--an application of marginal structural models. Value Health. 2010;13(8):1038-1045.

24. **Waari G, Mutai J, Gikunju J.** Medication adherence and factors associated with poor adherence among type 2 diabetes mellitus patients on follow-up at Kenyatta National Hospital, Kenya. Pan Afr Med J. 2018; 29:82.

25. **Davies MJ, D'Alessio DA, Fradkin J, et al.** Management of Hyperglycemia in Type 2 Diabetes, 2018. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care. 2018;41(12):2669–2701.

26. **Cotta RM, Reis RS, Batista KC, et al.** [Dietary habits of hypertensive and diabetic patients: rethinking patient care through primary care]. Rev Nutr. 2009;22(6):823-35.

27. **Grant RW, Devita NG, Singer DE, et al.** Polypharmacy and medication adherence in patients with type 2 diabetes. Diabetes C

العوامل المرتبطة بعدم الإلتزام بأدوية السكر فى مرضى السكرى بمحافظة المنوفية

مصطفى بكرى حامد عطا[١]، زينب عبدالعزيز قاسمى[٢]، محمد فهمى أمارة[٣]، أحمد محمد زهران[١] و شيماء كمال الدين زوين[١]

[١]قسم الباطنة العامة، [٢]قسم الصحة العامة وطب المجتمع، كلية الطب، جامعة المنوفية

[٣]قسم الباطنة العامة، كلية الطب، جامعة الفيوم.

الخلفية: يعد عدم الالتزام بالعلاج مشكلة شائعة ومهمة في رعاية مرضى السكري والتي تؤثر سلبًا على نتائج العلاج. ولذلك ينبغي علينا بذل الجهود لفهم حجم المشكلة والبدء في حلها.

الأهداف: تحديد مدى اختلاف الالتزام بالدواء بين المرضى الذين يعانون من داء السكري من النوع الثانى وتوضيح العوامل التي تساهم في الالتزام بالدواء في هذه الفئة من المرضى، وكيف يؤثر ذلك على مضاعفات السكرى وخاصة الأوعية الدموية الدقيقة.

المرضى وطرق الدراسة: دراسة مقطعية أجريت على ٥٧٠ مريضًا بالسكري باستخدام استبيان يشمل مقابلتهم وجهًا لوجه في العيادات الخارجية للغدد الصماء وأجنحة المرضى الداخلية بمستشفيات جامعة المنوفية في الفترة ما بين ديسمبر ٢٠٢١ وديسمبر ٢٠٢٣. تم اخذ التاريخ المرضى الكامل والفحص الاكلينيكى وتم الحصول على التحاليل الطبية لهم وتم تقييم حالة الالتزام بالدواء باستخدام مقياس الالتزام بالأدوية (Morisky (MMAS.

النتائج: بلغ معدل انتشار عدم الالتزام بالأدوية في الدراسة ٦٢,٨٪. وظهرت عوامل خطورة ضعف الالتزام بالأدوية مثل اختلاف المستوى التعليمي، ضعف دخل الأسرة، وزيادة مدة الإصابة بمرض السكري، والمرضى مستخدمى الأنسولين. و لم يكن العمر والجنس ووجود أمراض مصاحبة أخرى مهمًا بين المرضى الذين شملتهم الدراسة.

الاستنتاج: انخفاض الدخل، وانخفاض المستوى التعليمي، وطول مدة الإصابة بمرض السكري واستخدام الأنسولين يساهم في ارتفاع معدل انتشار عدم الالتزام بالدواء بين مرضى السكري، والذي بدوره مسؤول عن شدة مضاعفات السكرى ومنها الأوعية الدموية الدقيقة.