





# The Causes of Non-Compliance to Treatment Among Type 2 Diabetes Mellitus Patients

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## ABSTRACT

**Background:** Generally, type 2 diabetes mellitus can end with many complications, which leads to severe unwanted health problems that can be prevented by strict adherence to the prescribed methods of management conducted by the physician. So, this study was designed to evaluate the range of the patient's compliance to therapy (drug, diet, and exercise).

**Methods:** An analytic cross-sectional study evaluated 380 convenient samples with type 2 diabetes visiting private internal medicine clinics in AL-Kut city and over 18 years. All patients were consented to participate and full a pre-tested questionnaire consisting of questions related to the causes of non-compliance to the management protocol.

**Results:** The sample consisted of 209(55%) females, 91.8% were from urban regions, and 43.2% had a college degree or above educational level. There were 64.2% who was continuously measuring their glucose level, but only 39.2% visiting the doctors regularly. On the other hand, most patients (78.4%) declared that they complied with drug therapy. On the other hand, only 20.5% of patients always follow the doctor's instructions regarding a healthy diet, while 9.7% mentioned compliance with regular exercise. The significant causes of non-compliance to the drug were costly drugs in (25.4%) and (19.8%) for the forgetting. There were 123(62.4%) who did not care about healthy food, and 119(42%) could not practice exercise because they could not do that.

**Conclusion:** The higher rate of non-compliance for diet and exercise focuses on the need for an actual intervention to increase the awareness about the importance of these two management types.

**Keywords:** diabetes mellitus, adherence, compliance, anti-diabetic drugs, healthy diet

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## INTRODUCTION

The disease Diabetes mellitus (DM) is one of the metabolic disorders distinguished by high blood sugar rises from either defect in secretion of insulin (type1), insulin activity (type2), or mixed [1]. Even though type 2 diabetes usually occurs in individuals above 40 years old, it is becoming progressively common in children, teenagers, and youthful grown-ups due to diminished physical movement and unhealthy eating foods driving obesity [2]. The predominance of diabetes mellitus is developing quickly around the world and is becoming to be an epidemic. It is evaluated that there are now 285 million individuals with diabetes worldwide and expected to reach 438 million by 2030 [3]. Epidemiological information shows that all countries, wealthy and destitute, are enduring the effect of the diabetes epidemic. The effect is worse in those nations that are socially and financially impeded. In Africans, 80% of diabetes patients are undiscovered. Most of them may be asymptomatic or have gentle

indications which they disregard or quality to other myths. A few may not display in a clinic out of destitution when symptomatic because of poverty [4]. DM could be a challenging disease to be treated effectively. It requires regular physician visits, self-monitoring of blood glucose, dietary alterations, works out, and organization of medicines as per plan. So, regimen adherence issues are common in people with diabetes, hence making glycemic control troublesome to achieve [5-7]. Later information from the American Diabetes Association (ADA) targets HbA1c levels less than 6% is broadly utilized as the standard biomarker for the amplexness of glycemic control [8,9].

In order to manage patients with diabetes mellitus, there are two approaches, including pharmacological drugs and other nonpharmacological methods. The nonpharmacological procedures incorporate changing lifestyle, dietary alteration, and physical activity. The pharmacological approach is utilized when the nonpharmacological approach cannot attain the required result [10]. Many factors contribute to successful management programs like age,

the number and complexity of medication, disease duration, and related psychosocial issues [11].

Adherence rates are ordinarily higher among patients with acute conditions than those with chronic conditions [12]. Researchers have found that adherence to medications in chronic disease can reach only 50% [13,14]. Numerous diabetic patients fail to follow their management regimen for different reasons, including forgetfulness, reduced understanding of the nature of their condition, prohibitively expensive drugs, and their old-style views of the illness. Other related distinguished factors are depression and emotional distress, arrangements that do not start on time, insignificant provider-patient relationship, the difficulty of regimen, restricted daily life activities, and fear of hypoglycemia at any time [15]. Poor compliance with medication is considered a common problem is contributing to an effective rate of complication and death among patients. Specialist physicians need to continuously search for the adherence rate among patients and focus on the leading causes of poor adherence by making the regimen simple, efficiently conducted, and appropriate to the patient's lifestyle.

The problem seen in previous research about the same topic includes lack of adherence, aggravation of complications, lack of exercise, non-adherence to a healthy diet, and other factors that led us to fill the gap and search for many answers concerning our research. Therefore, this study aimed to determine the prevalence of non-adherence and the contributing factors among type 2 diabetic patients in Wasit province, Iraq.

## PATIENTS AND METHODS

### Study Design and Setting

An analytic cross-sectional study was conducted among type 2 DM patients visiting private internal medicine clinics in AL-Kut city, Wasit province/ Iraq. AL-Kut is the centre of Wasit province, which is located in the middle of Iraq. According to the latest Iraqi census in 2014, it is assumed that around 422.793 people lived in this city from the total one and a half million people who lived in Wasit. There are many private clinics for diabetes management distributed in the city, reaching around 40 clinics. Data were collected during the period from December 2020 to May 2021.

### Sample Size and Sampling Procedure

The sample was collected conveniently from 10 randomly selected internal medicine private clinics in AL-Kut city. The sample size was calculated based on the equation for cross-sectional studies, which is: " $n = z^2 (p-1) / d^2$ " considering the prevalence of good knowledge (45%) [16], the confidence level (95%),  $d=0.05$ , and the power (80%), the minimal sample size required for this study was 380 patients.

### Inclusion Criteria

Patients previously diagnosed with type 2 DM and aged more than 18 years.

### Exclusion Criteria

Patients with acute and painful conditions urgently want to back home.

### Data Collection

Data were collected using a structured questionnaire developed by the authors and consisting of two parts; part one contained socio-demographic features like age, gender, marital status, educational status, occupation, and place of living. The second part includes data about the prescribed methods for controlling the levels of blood sugar, which were: oral medications, a healthy diet, exercising, and insulin. In addition, causes of non-compliance to each type of treatment were also included. The presence of other chronic conditions and the duration of diabetes were also documented.

Before initiating the formal test on about ten diabetic patients, the questionnaire was pre-tested to do any necessary correction and clearness. Questionnaires were self-administered and distributed to selected patients in the selected clinics and then returned after complete filling. Body Mass Index (BMI) was calculated for each student according to their weight and height and classified according to Centres for Diseases Control and Prevention (CDC) classification to underweight, normal, overweight, and obese [17].

### Statistical Analysis

Statistical Package for Social Sciences (SPSS) software version 26 was used for data analysis. Categorical data were presented by frequency and percentages, while continuous data were presented by mean and standard deviation. Association between categorical variables was obtained by Chi-square test while differences between means were calculated by both independent sample t-test and One way ANOVA test. P-value equal to or less than 0.05 was considered significant.

### Ethical Consideration

Ethical approval was obtained from the College of Medicine, Wasit University. All participated patients gave their informed consent to fill the questionnaire after being informed about the study's objective and keeping their data confidential.

## RESULTS

The result of this study was based on the analysis of 380 completed questionnaires from patients diagnosed with type 2 DM. The mean age and standard deviation for those patients were (49.11±16.78) years, and the mean BMI was (27.56±5.22) kg/m<sup>2</sup>. Female patients represented more than half (55%) of the participants, and most of the patients (66.6%) were married. **Table 1** also shows that the majority (91.8%) living in urban places. There were 183 patients (43.2%) having their college degree even that (39.2%) were unemployed or students. Only 2.6% of the sample were underweight, and 29% had average weight; the remaining were overweight and obese.

**Table 2** shows that 185/380 (48.7%) mentioned having other chronic diseases; only 6/185 (3.2%) did not use drugs for this disease. Hypertension was the most frequent chronic disease that accompanies diabetes in about 153 patients (64%). Note that patients may have more than one other chronic condition in addition to DM.

Near one-third of the sample (30.8%) was diagnosed with DM before more than ten years. Although 244 of the patients (64.2%) were regularly measuring their glucose level, 60.8% of patients never visit their physicians regularly because 46.3% feel no need to that, and 34.2% had an economic barrier. The treatment prescribed by doctors was

**Table 1.** Socio-demographic features of the 380 diabetic patients who participated in the study

	Variables	Frequency	Percent
Gender	Male	171	45.0
	Female	209	55.0
Marital status	Single	80	21.0
	Married	253	66.6
	Divorced or widowed	47	12.4
Place of living	Urban	349	91.8
	Rural	31	8.2
Educational status	No education/ read and write	47	12.4
	Primary and intermediate	61	16.0
	Secondary school	89	23.4
	College and above	183	43.2
Occupation	Governmental employee	97	25.5
	Retired	77	20.3
	Self-employer	57	15.0
	Not employed or student	149	39.2
Average family's monthly salary	Less than 500,000 IQ. D*	121	31.8
	Between 500000-1million IQ. D*	133	35.0
	More than one million IQ. D*	126	33.2
Weight according to Body Mass Index (BMI)	Underweight	10	2.6
	Normal weight	110	29.0
	Overweight	152	40.0
	Obese	108	28.4

\*Iraqi Dinars

**Table 2.** The presence of other chronic conditions co-existing with DM

	Variables	Frequency	Per cent
Presence of other chronic diseases	Yes	185	48.7
	No	195	51.3
Take drugs for other chronic diseases (185)	Yes	179	96.8%
	No	6	3.2%
Type of other chronic diseases	Hypertension	153	64%
	Heart disease	55	23%
	Endocrine diseases	12	5%
	Others	19	8%

**Table 3.** Frequency distribution of variables related to diabetes mellitus disease among 380 patients

	Variables	Frequency	Per cent
Duration of DM*	Less than a one year	56	14.7
	1-5 years	113	29.7
	5-10 years	94	24.7
	More than ten years	117	30.8
Management prescribed by doctors for DM*	Oral tablets	299	47.9%
	Nutritional therapy	182	29.2%
	Exercise and sport	68	10.9%
	Insulin injection	75	12.0%
Do you measure your blood glucose regularly?	Yes	244	64.2
	No	136	35.8
Do you visit your doctor regularly?	Yes	149	39.2
	No	231	60.8
The Causes of not visiting doctors regularly among 231 patients.	Economic causes	79	34.2%
	Feel no need, not important	107	46.3%
	Forget	36	15.6%
	Other causes like do not like doctors, coronavirus.	9	3.9%

\*Diabetes Mellitus

mainly oral tablets (47.9%), nutritional therapy (29.2%), insulin (12%), and exercise (10.9%) (Table 3).

Reasons for non-compliance to treatment were presented in Table 4. Among those 82/380 (21.6%) patients who did not adhere to their

drugs, 32 patients (25.4%) defined expensive drugs as a significant cause, followed by 19.8% who forget drugs, and 15.9% were careless about their treatment therapy. Only three patients (2.4%) did not understand the correct way of using it. Near one quarter, 24% said they did not

**Table 4.** Frequency of compliance to treatment and causes for non-compliance among type 2 DM patients

	Variables	Frequency	Per cent
<b>Do you comply with drug therapy?</b>	Yes	298	78.4
	No	82	21.6
<b>Causes of non-compliance to oral tablets</b>	Feel no need for drugs	5	4.0%
	Careless	20	15.9%
	Lots of treatments	12	9.5%
	The side effect of drugs	10	7.9%
	Expensive drugs	32	25.4%
	Not understand the way	3	2.4%
	Forget	25	19.8%
	Long treatment period	11	8.7%
<b>Do you comply with food prescribed by the doctor?</b>	Yes, always	78	20.5
	Yes, sometimes	211	55.5
	Not adhered at all	91	24
<b>Causes of non-compliance to healthy food</b>	Not able to provide healthy food	25	12.7%
	Don't care	123	62.4%
	No time for prepare food	22	11.2%
	No one help in preparing the food	21	10.7%
	Not able to control my appetite	6	3.0%
<b>Do you practice exercise?</b>	Yes, regularly	37	9.7
	Yes, irregularly	122	32.1
	No exercise at all	221	58.2
<b>causes of non-compliance to exercise</b>	No time	93	32.9%
	No suitable place	67	23.7%
	Not interested or care	4	1.4%
	Not able to do	119	42.0%

adhere to the prescribed healthy dietary regime; the leading cause was carelessness in 62.4%, followed by the inability to provide this type of food in 12.7%. Only 39(9.7%) of patients practice regular exercise. Of the remaining 341patients, there were 221 who never do any exercise at any time, and the major causes were that they were not able to do it (42%) and having no time (32.9%).

The results of **Table 5** found a significant association between occupation with the three types of treatment (drugs, diet, and exercise) with p-values 0.006, 0.017, and 0.020 in the same order.

The gender of the patients was associated with only exercise (p-value = 0.008). Educational level was associated with compliance to diet and exercise (p-value = 0.021, 0.002) in respectively. Age and marital status were significantly associated with drug and exercise adherence (p-value < 0.001). The average family monthly salary was associated with only drug compliance (p-value < 0.001), while the BMI category was associated with both diet and exercise (p-value for diet = 0.003 and exercise = 0.023).

## DISCUSSION

As the adherence to treatment in patients living with chronic diseases like DM is of significant effect in controlling symptoms and preventing future complications, a community-based cross-sectional study was done to estimate the prevalence of treatment non-compliance among patients with type 2 DM and also to determine the factors associated. The management of diabetes mellitus includes both pharmacologic and nonpharmacologic methods. To be well controlled and treated, patients need to comply with all doctor instructions to get the required objective from both approaches. Despite this reality, many

patients never adhere to their suggested treatments and doctor advice which may be related to a lot of contributed factors [18].

In the current study, we noticed that the number of females who participate in the study slightly exceeds the number of males, and this may be related to the fact that females are generally more than males in our country [19] or were more interested in participation rather than males. Even there was no definite difference between both sexes in the prevalence of DM, previous studies found a significant increase in the prevalence of DM among women relative to men, and this also can explain the higher percentage of females in our sample [20,21]. The majority of the patients were overweight and obese because it is a known risk factor for type 2 DM. It was proven that obesity could cause a disturbance in the mechanism of insulin resistance in responsive cells, including liver, muscle, and adipocyte leading to reducing their responsiveness to insulin and, finally, type 2 DM [22-24]. Patients in this study mainly came from urban regions rather than rural areas, maybe because of ease of access to private clinics in city centres. In addition, people with higher educational levels tend to participate more than people with lower educational levels.

Literature assumed that patients with long-term conditions show a relatively low level of medication adherence, especially after six months from starting the treatment, and this is still the top priority for governmental and non-governmental organizations to work on [12,25]. However, the current study showed that more than three-quarters of patients reported good compliance to medication and (21.6%) missed their medication treatments. This result was better than rates showed the Indian diabetic population in 2018 with 29.7% non-compliance to medications [26]. Another study conducted in Ajman appeared an 84% compliance rate to treatment, and patients related this to expanded mindfulness and advantage from the broadly dispersed data

**Table 5.** Association between compliance to treatment with the selected socio-demographic feature of patients.

Variables	Compliance with drug		P- value	Compliance with healthy diet			p-value	Compliance with the exercise			p-value					
	Yes	No		Always	Sometimes	Not adhere		Regular	Irregular	No exercise						
Gender	Male	No.	139	32	0.219	37	96	38	0.743	22	64	85	0.008			
		%	46.6	39		47.4	45.5	41.8		59.5	52.5	38.5				
	Female	No.	159	50		41	115	53		15	58	136				
		%	53.4	61		52.6	54.5	58.2		40.5	47.5	61.5				
Occupation	Governmental	No.	75	22	0.006	22	54	21	0.017	8	43	46	0.020			
		%	25.2	26.8		28.2	25.6	23.1		21.6	35.2	20.8				
	Retired	No.	70	7			18	43		16		6		16	55	
		%	23.5	8.5			23.1	20.4		17.6		16.2		13.1	24.9	
	Self-employed	No.	47	10			8	24		25		4		16	37	
		%	15.8	12.2			10.3	11.4		27.5		10.8		13.1	16.7	
Not employed	No.	106	43		30	90	29		19	47	83					
	%	35.6	52.4		38.5	42.7	31.9		51.4	38.5	37.6					
Place of living	Urban	No.	278	71	0.50	71	197	81	0.428	35	110	204	0.639			
		%	93.3	86.6		91.0	93.4	89.0		94.6	90.2	92.3				
	Rural	No.	20	11			7	14		10		2		12	17	
		%	6.7	13.4			9	6.6		11.0		5.4		9.8	7.7	
Educational levels	No education	No.	39	8	0.366	9	19	19	0.021	2	9	36	0.002			
		%	13.1	9.8		11.5	9	20.9		5.4	7.4	16.3				
	Below secondary	No.	44	17			14	28		19		5		10	46	
		%	14.8	20.7			17.9	13.3		20.9		13.5		8.2	20.8	
	Secondary	No.	67	22			15	53		21		9		34	46	
		%	22.5	26.8			19.2	25.1		23.1		24.3		27.9	20.8	
College & above	No.	148	35		40	111	32		21	69	93					
	%	49.7	42.7		51.3	52.6	35.2		56.8	56.6	42.1					
Marital status	Single	No.	43	37	<0.001	19	47	14	0.426	15	43	22	<0.001			
		%	14.4	45.1		24.4	22.3	15.4		40.5	35.2	10				
	Married	No.	212	41			48	142		63		19		74	160	
		%	71.1	50			61.5	67.3		69.2		51.4		60.7	72.4	
	Divorced or widow	No.	43	4			11	22		14		3		5	39	
		%	14.4	4.9			14.1	10.4		15.4		8.1		4.1	17.6	
Average monthly salary	<500000 IQ. D	No.	81	40	<0.001	24	66	31	0.771	15	34	72	0.096			
		%	27.2%	48.8		30.8	31.3	34.1		40.5	27.9	32.6				
	500000-1 million	No.	107	26			26	72		35		6		44	83	
		%	35.9	31.7			33.3	34.1		38.5		16.2		36.1	37.6	
	More than 1 million	No.	110	16			28	73		25		16		44	66	
		%	36.9	19.5			35.9	34.6		27.5		43.2		36.1	29.9	
Bodyweight	Under weight	No.	5	5	0.172	2	5	3	0.003	0	3	7	0.023			
		%	1.7	6.1		2.6	2.4	3.3		0	2.5	3.2				
	Normal weight	No.	86	24			22	69		19		17		42	51	
		%	28.9	29.3			28.2	32.7		20.9		45.9		34.4	23.1	
	Overweight	No.	121	31			36	89		27		15		48	89	
		%	40.6	37.8			46.2	42.2		29.7		40.5		39.3	40.3	
	Obese	No.	86	22			18	48		42		5		29	74	
		%	28.9	26.8			23.1	22.7		46.2		13.5		23.8	33.5	
Age in years	Mean age		51.47	40.51	<0.001	49.86	47.49	52.21	0.073(one way ANOVA)	42.76	43.05	53.51	<0.001			
	Standard deviation		16.10	16.47	(Independent t- test)	18.39	16.96	14.45		19.44	17.75	14.26	(one way ANOVA)			

concerning their disease and medications straightforwardly from their doctor and involve them in decision making about their treatment [27].

Patients within the current study appeared that they were more adherence to dietary instructions than practising physical activity. Our rate was nearly similar to the rate shown in Alexandra, Egypt, which found that 58.8% of patients complied with diet while only (51.7%) were

compliant to exercise [28]. This may be due to easy to control diet and follow doctor instructions than performing a regular healthy exercise the simpler to take after healthy diet instructions than an exercise administration. The highest percentage of the patients said they could not exercise; others mentioned having no time or suitable place to do

so. In Northern Finland, dietary adherence has been mentioned by (62.4%) diabetic patients [29].

The gender of the patient was significantly associated with the level of practising exercise. Females were less likely to be compliant with exercise than males, and this is not surprising in our community, which restricts females' freedom and their jobs in homes, making them busy most of the time—increasing educational level significantly leading to increasing compliance to medications, healthy diet, and exercise. This has already been proved by studies conducted in Saudi Arabia and the United Arab Emirates (UAE) [30,31] and may be related to their awareness of diabetic complications, which may be leading to ending their lives [32]. Furthermore, the married patients showed a significantly higher percentage of drug and exercise which can be linked to the tremendous support their spouse or other relations. Similar results were also shown in the Saudi Arabia study [30].

In this study, the occupation is associated with treatment adherence, like in the Bisha governorate of Saudi Arabia [33]. Non-employed or student patients who had a higher percentage of compliance in all aspects of treatment (drug therapy, diet, and exercise) may be due to the availability of time to take care of their health and follow doctor's instructions. The monthly family salary is significantly associated with compliance to drug therapy as a close-quarter of patients mentioned the expensive cost of the drugs as a barrier to adhere to medication. Similarly, Wabe et al. concluded that 37% of non-adherent Ethiopian patients had financial limitations [34]. This is a significant problem because numerous anti-diabetic medications are so expensive that patients need to use them continuously. This problem should be resolved by arranging free drugs for patients from the hospitals [35]. Patients with lower monthly salaries were less likely to adhere to their medications than those with a monthly salary between (500.000 -1 million IQ. D) or greater than 1 million (note that each 1\$ averaged 1450-1500 Iraqi Dinars). Previous studies conducted in different world regions reported lower income led to lower medication adherence [18,34,36,37]. They explained this as those who obtain more money are paying more for their health and treatment, and they can pay for varied suppliers of medication information, including books, television, radios, and magazines. Forgetfulness was the second most common reason for non-compliance to drugs in our current study. On the contrary, our finding was shown to be the most typical reason for non-compliance by Nigerian patients [38]. Most of the participants in this study were in their seventh to the eighth decade and may complain of memory impairment problems.

According to Barclay et al. [39], dietary modification is required for type 2 diabetes mellitus patients. This includes a diet low in saturated fat, sodium and carbohydrate, and high fibre contents. The importance of dietary modification in patients with type 2 diabetes is to decrease body weight by about 5-10%, controlling blood sugar, and prevent or reduce future complications like cardiovascular and renal problems. Unfortunately, most patients in this study suffer from overweight and obesity, which was found to be associated with their compliance to dietary instructions and exercise.

## LIMITATIONS

There are some limitations in our study, such as the majority of respondents were with high educational levels, and the selected clinics were from city centres only. The other problem we faced was the

Coronavirus pandemic which affected the number of samples, and perhaps there are some non-committal people that we could not see to know the reasons for their non-compliance.

## CONCLUSION AND RECOMMENDATIONS

In conclusion, it turns out that the majority of the patients respond to the drugs prescribed by their doctor. In comparison, a minority do not get them due to the expense of the drugs. Finally, another line was studied, which is the food restriction. Here, a significant number of the collected sample do not comply with a healthy diet due to their carelessness. As for exercise, ups and downs ranged from no time to do sport to not being able to.

This study recommends a governmental intervention with the costs and accessibility of the drugs utilized to treat DM. Awareness programs encourage a healthy lifestyle. Furthermore, define its significance for individuals with type 2 DM. Further studies are recommended to assess different adherence and non-adherence issues within the region.

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