TECHNIUM
SOCIAL SCIENCES JOURNAL

Vol. 37, 2022

A new decade for social changes

www.techniumscience.com

ISSN 2668-7798

TECHNIUM SOCIAL SCIENCES JOURNAL

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Adherence to Treatment in Diabetic Patients in Lebanon

Nour Yassin

Beirut Arab University

ynour1425@gmail.com

Abstract. Non-adherence to prescribed treatment represents an important dilemma that deserves special attention especially when dealing with chronic and critical diseases as in diabetes mellitus. The objective of this study was to evaluate the level of adherence in Lebanese adult outpatients suffering from diabetes mellitus, where they may present other illness and to identify the possible predictors of non-adherence in this patient group.A questionnaire was administered face-to-face to a sample of Lebanese adults visiting two pharmacies and two endocrinologist clinics. The questionnaire covered the socio-demographics, lifestyle and health status of the patients, regimen characteristics, drug affordability, relationship with healthcare provider, and patients' attitudes and beliefs. The level of adherence was assessed using the 8-item Morisky Medication Adherence Scale. Statistical analysis was performed using SPSS version 17. Univariate associations between drug adherence and patient and drugs characteristics were tested using chi-square test. Out of the 130 patients included in this study, 64.6% were classified as adherent and 35.4% were not. In the univariate analyses, statistically significant predictors of low adherence included smoking status($p=0.012$) , level of stress and anxiety ($p=0.009$), monthly cost in LL ($p=0.049$), changing treatment plan a lot recently ($p=0.010$), taking any acute drugs ($p=0.014$), forgetting to take their pills ($p<0.001$), taking their medicine over the past two weeks ($p<0.001$), cutting back or stop taking their medication without telling their doctor because they felt worse when they took it ($p<0.001$), forgetting to bring along their medications during traveling ($p<0.001$), stop taking their medicine when they feel that the disease is under control ($p<0.001$),feeling disturbed taking medication everyday ($p<0.001$), difficulty remembering to take all their medications ($p<0.001$).As forgetfulness being the most important reason of patient non adherence, there should be a cooperative work between healthcare providers in order to overcome such a problem where they should create methods that help in educating patients and improving their adherence.

Keywords. Adherence, Treatment, Diabetic Patients, Morisky scale

Introduction

Diabetes mellitus (DM) is a growing health problem with a continuously increasing prevalence and high levels of morbidity and mortality. The International Diabetes Federation has predicted that there will be 380 million individuals with diabetes in 2025 compared with an estimated 240 million individuals in 2007, with a higher disease burden in low- and middle-income nations [1]. Effective and successful glucose control requires the use of effective medications over time. The morbidity and mortality resulting from micro- and macro-vascular complications of type 2 DM, place a considerable financial burden on individual patients and

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

on society [2, 3]. Although there are many factors that affect glycemic control among patients with diabetes, it is known to be improved by adherence to DM medications, and treatment utility is limited by lack of adherence [4–6].

The definition of the terms adherence, compliance, and persistence is a controversial issue among scientists, but in the recent literature, the terms 'adherence' and 'compliance' are becoming interchangeable [7, 8]. However, medication compliance initially referred to the extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen [7, 8]. It is measured over a period of time and reported as a percentage. On the other hand, persistence refers to the duration of time from initiation to discontinuation of therapy in which the patient continues to take any amount of the medication [7, 8]. Today, the term 'compliance' is used less frequently because it implies that only the patients is responsible for the medical treatment [7, 8]. The term 'adherence' has now replaced 'compliance', because it includes the responsibility of the caregivers. Adherence has been defined as 'the active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behavior to produce a therapeutic result [7, 8].

The problem with drug non-adherence doesn't only lie in the failure to achieve treatment goals. Non-adherence has been associated with several other consequences. Non-adherence is associated with increased mortality, increased risk of hospitalization, and significantly increased medical costs [9, 10].

To improve medication adherence, the multifactorial causes of decreased adherence must be understood. The WHO classifies these factors into 5 categories: socioeconomic factors, factors associated with the health care team and system in place, disease-related factors, therapy-related factors, and patient-related factors [11].

Lots of studies targeted the issue of adherence predictors, seeking a deeper understanding of adherence barriers. Patient related characteristics include socio-demographics which were shown to affect adherence in some studies, while other studies rejected this theory. Those include sex, age, race, educational level, and marital and employment statuses [12].

Some studies showed that females adhere better to their medications; some others suggest that men adhere better, and other studies denied any gender difference [12]. Many studies addressed age as a predictor which resulted in adherence studies targeting certain age groups; discussing the issue of adherence in the elderly or in teenagers, as each of these age groups report individual barriers to adherence [13]. Other patient related factors include patient's lifestyle. As previously mentioned, adherence to drug therapy is an indicator of an overall healthy behavior [14]. It is also an indicator of better health awareness, drug knowledge, and a positive attitude towards the treatment. In fact, recent literature shows a great interest in patient beliefs and many studies suggest that it is the most important and powerful predictor of non-adherence [14]. The fear of side-effects, little drug knowledge, the perception of overmedication, and low perceived health status were found to be critical barriers [15].

Effective strategies to improve adherence in patients with chronic disease is a relatively recent subject in drug research. Most of the studies focused on identifying barriers rather than testing methods of improving adherence. Some effective measures in improving drug compliance target the drug regimen. Reducing drug cost [10], decreasing the frequency of administration [8, 16, 17], the use of fixed dose combinations [8, 18], and the use of generic drugs [19, 20] were found to improve adherence levels.

As this subject was considered to have a highly important role in improving treatment goals, the objective of this study was to evaluate the level of adherence in Lebanese adult

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

outpatients suffering from diabetes mellitus, where they may present other illness and to identify the possible predictors of non-adherence in this patient group.

Patients and Methods

Sample

This is a transversal prospective pilot study assessing adherence in type II diabetic Lebanese outpatients. A convenience sample of patients was randomly selected from those visiting two pharmacies: AL CHIFAA pharmacy (Bekaa) and FARDOUN pharmacy (South Lebanon) and two endocrinologist clinics: Dr.Mazen Koteish (msharafeyye) and Dr.Ihab Fardoun (Tyre). The objectives of the study were explained to individual patient. Patients were asked if they have been taking any antidiabetic medications for more than three months. Only those who were interested and who gave their voluntary informed oral consent to participate in the study were enrolled. Patients were assured of their anonymity and confidentiality of responses. Data were collected from the 1st of February till the 30th of March 2014.

Inclusion criteria

Eligible participants were adult outpatients (≥25years). The patients should be diagnosed and treated for type II diabetes mellitus. They should be taking their medication(s) for 3 months or more.

Our sample was including patients treated for type II diabetes mellitus where they may present other chronic co morbidities.

Type of study

This is a transversal prospective pilot study assessing adherence in type II diabetes mellitus Lebanese outpatients. Data were acquired through a structured questionnaire filled by an interviewer. The questionnaire included many sections. The possible reasons for medication non-adherence were included in different sections of the questionnaire and were chosen following an extensive review of literature; it contained some of the intentional and unintentional barriers or reasons for non-adherence among patients taking chronic drugs.

Questionnaire

The questionnaire consists of eight sections (Annex):

- The first section obtained information on socio-demographic data including age, sex, occupation, educational and marital status, monthly income, and the presence of a care provider at home.
- The second section obtained information about lifestyle data: smoking status (non smoker, ex smoker or smoker), sports (doing or not), stress level (none, sometimes or all the time), and memory status (forgetfulness: never, sometimes or all the time).
- The third section assessed the patient's health follow-up and diet adherence.
- The forth section was concerned with the drug regimen: the number of drugs patient takes daily, the number of drugs the patient recalls their names, the duration since the administration of the diabetic drug, drug cost, medical insurance (yes or no), having difficulty paying for their medications (yes or no), previous side-effects (yes or no), reaction towards such side-effects (told the doctor or stopped taking the drug), administration of acute drugs (yes or no), and whether the drug regimen has changed a lot recently (yes or no).
- The fifth section assessed the patient's relationship with the healthcare providers: the physician and the pharmacist. The patients were asked whether the healthcare providers explained the regimen and disease and the number of providers they consult.

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

- The sixth section provides information about the patients' attitudes, behaviors, knowledge, and patients' opinions on some of the likely reasons for their non-adherence.
- The seventh section assessed patient adherence using 8-MMMAS (8-item modified Morisky medication adherence scale).
- The last section provides information about measuring HbA1C, duration between two measurements and the value of last measurement.

Scale validation

Patient adherence was assessed through self-report using 8-MMMAS (8-item modified Morisky medication adherence scale) in the seventh section. The scale is a widely used and validated method to assess patient adherence/non-adherence to drug regimen. It includes questions about intentional and non-intentional non-adherence. The Arabic version was used in the questionnaires. The scale consists of 8 questions about intended and non-intended drug non-adherence. The first 7 questions are dichotomous (yes/no) while the last question is a 5-item Likert scale. It was dichotomized for the statistical analysis so the final score was 8. A score between 0-5 represents non-adherence and 6 through highest represents adherence. An addition for all the eight scores was done for each patient. As the score increase, it indicates an increase in adherence for the patient.

Morisky questions and its scores

Question	**Yes**	**No**
1- Do you sometimes forget to take your pills?	0	1
2- People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine?	0	1
3- Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	0	1
4- When you travel or leave home, do you sometimes forget to bring along your medications?	0	1
5- Did you forget to take your medications yesterday?	0	1
6- When you feel like your disease is under control, do you sometimes stop taking your medicine?	0	1
7- Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	0	1
	Sometimes/Often/Always	**Never/Rarely**
8- How often do you have difficulty remembering to take all your medications?	0	1

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Sample size

The study was done on a convenience sample, as this is a pilot study.

Data entry and statistical analysis

Data was entered and analyzed using SPSS version 17.

Descriptive statistics including frequency, mean, and standard deviation were used to summarize patients' baseline socio-demographic data and evaluate distribution of responses.

The dependent variable was the medication adherence: a dichotomized MMMAS.

Chi-square test was done. A p-value of 0.05 or less was considered to be statistically significant in the tests.

Results

One hundred and thirty patients were included in this study. The mean age was 59.39 years ± 13.12 and ranged between 25 and 88 years. 56.2% were males and no significant age difference (p=0.578) was found between males (58.82 years ± 13.71) and females (60.12 years ± 12.47)

General characteristic of the study population

The majority of the study population was married (83,8%) and had an elementary education (43.8%). 45.4% of the study sample was unemployed.79% reported having a daily break during their working hours. 92% of the working group has a monthly income between five hundred and one million LL. 38.5% of the studied sample had a caregiver at home (Table 1).

Table 1: General characteristics of the study population

Characteristics		
Age in years	**Mean 59.39 SD 13.127 Range [27-88]**	
	Frequency	**Valid Percentage (%)**
Sex		
Males	73	56.2
Females	57	43.8
Marital Status		
Single	8	6.2
Married	109	83.8
Divorced	6	4.6
Widowed	7	5.4
Educational Level		
Illiterate	34	26.2
Elementary	57	43.8
Intermediate	21	16.2
Secondary	10	7.7
University	8	6.2
Employment Status		
Unemployed	59	45.4
Employee	44	33.8
Self-employed	27	20.8

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Working Hours		
[3-8] hours	106	81.5
[7-16] hours	24	18.5
Daily Break		
Yes	79	60.8
No	51	39.2
Monthly Income		
[500,000-1,000,000 L.L.]	92	70.8
[1,000,000-2,000,000 L.L.]	26	20
[>2,000,000 L.L.]	12	9.2
Care provider at home		
No	80	61.5
Yes	50	38.5

Healthy Lifestyle characteristics of the study population

Around half of the population were non-smokers (50.8%), had a very stressful life (25.4%), and had moderate memory problems (66.9%). Only 39.2% of the sample did sports on a regular basis, mainly walking (100%) four to seven times per week. Only 16.2% admitted not regularly monitoring important disease indicators (BP, BS, Cholesterol...). Among those who had a specific physician recommended diet (93.8%), 25% rarely adhered to this diet (Table 2).

Table 2: Healthy lifestyle characteristics of the study population

Characteristics:		
	Frequency	**Valid Percentage (%)**
Smoking status		
Non-smoker	66	50.8
Ex-smoker	38	29.2
Smoker	26	20.0
Regular sports		
Yes	51	39.2
No	79	60.8
Type of sports		
Walking	51	100
Missing	79	
Frequency per week		
[2-3]	21	41.17
[4-7]	30	58.82
missing	79	

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Levels of stress and anxiety None Moderate Severe	 13 84 33	 10.1 64.6 25.4
Memory (forgetfulness) Never Sometimes All the time	 28 87 15	 21.5 66.9 11.5
Do you regularly measure your BP, BS, Cholesterol, etc? No Yes	 21 109	 16.2 83.8
Did the Dr recommend a certain diet for you to follow? No Yes	 8 122	 6.2 93.8
How often do you adhere to this diet? Rarely Sometimes Always Missing	 25 63 34 8	 20.49 51.63 27.86

Drug regimen related characteristic

On average, patients reported taking 4 medications (mean=4.33 ±2.10). The number of drugs per patient ranged between 1 and 13. Patients recalled approximately 4 medications (mean=4.06 ±1.86) of the names of their drugs. The average monthly drug cost was 136, 46 LL (±107, 95). Patients visited 1.65 (±1.03) physicians every 5.21 (±3.31) months (Table 3).

Table 3: Drug regimen related Characteristics

	Mean	**SD ±**	**Range (Min-Max)**
Number of chronic drugs	4.33	2.103	1-13
Number of drugs the patient could state their names	4.06	1.867	1-12
Duration since the administration of the first chronic drug in months	48.63	34.841	3-168
Monthly cost of drugs in LL	136,469	107,951	8,000-600,000
Number of Drs patient visits	1.65	1.032	1-7
Frequency of visits (in months)	5.21	3.308	1-12

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Paying for drugs and treatment plan

Approximately half of the patients (49.2%) had a medical insurance; with 32.3% reported having a difficulty paying for their drugs. 21.5% experienced a previous drug side-effect, where 92.85% of them told their physician. Most of the patients did not experience a change in their treatment plans in the past months (77.7%). Along with their chronic medications, 81.5% used OTC painkillers or other acute drugs (Table 4).

Table 4: Paying for drugs and treatment plan

	Frequency	Valid Percentage (%)
Medical insurance		
No	64	49.2
Yes	66	50.8
Difficulty paying for drugs		
No	88	67.7
Yes	42	32.3
Ever experienced a drug related side-effect?		
No	102	78.5
Yes	28	21.5
Patient reaction		
Told Dr	26	92.85
Stopped taking drug	2	7.14
Missing	102	
Did your treatment plan change a lot recently?		
No	101	77.7
Yes	29	22.3
Do you take any acute drugs (pain killer, ATB, etc)		
No	24	18.5
Yes	106	81.5

Relationship with healthcare providers

Regarding the relationship with the care provider, 54.6% considered the physician (rather than the pharmacist) to be their primary reference regarding drugs and disease conditions.

91.5% reported that the physician explained the pathology and its severity and 92.3% that the physician asked about previous medications before prescribing new ones. 92.3 % of the patients reported that the physician explained to them how to take their medications and 95.4% reported that the pharmacist did (Table 5).

Table 5: Relationship with healthcare providers

	Frequency	Valid Percentage (%)
Whom do you consult more regarding your drugs and disease?		
Dr	71	54.6
	59	45.4

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Pharmacist		
Did the Dr ask you about drugs you are already taking before prescribing new one? Yes No	 120 10	 92.3 7.7
Did the Dr explain to you how to take your medications? Yes No	 120 10	 92.3 7.7
Did you fully understand how to take them? Yes No	 121 9	 93.1 6.9
Did the Pharmacist explain to you how to take your medications? Yes No	 124 6	 95.4 4.6
Did you fully understand how to take them? Yes No	 126 4	 96.9 3.1

Patient attitudes and knowledge

Although about half of the study population(40.8%) responded that nothing would make them stop treatment, they thought that they are over-medicated(40%), reported postponing physician's appointments(55.4%), and considered forgetfulness(38.5%) as the most important reason that would make them stop their medications. The majority believed that they cannot skip or double doses on their own (92.3%), would not stop their treatment even if advised to do so (90.8%), and believed that their treatment is improving their condition (92.3%) (Table 6).

Table 6: Patient attitudes and knowledge

	No	**Yes**
Do you think you are over-medicated?	60 %	40 %
A person can take double the dose to feel better or skip a dose if he felt worse	92.3 %	7.7 %
Do you usually postpone doctor's appointments?	44.6%	55.4 %
If someone you trust advised you to stop your treatment, would you?	90.8 %	9.2 %
Do you believe that drug therapy will improve your condition?	7.7%	92.3 %
What is the most important reason that would make you stop taking your drugs?		

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

	Frequency	Valid Percent (%)
Drug Cost	23	17.7
Forgetfulness	50	38.5
Regimen is too complicated	4	3.1
Nothing would make me stop	53	40.8
Total	130	100

HbA1c measuring

The majority of the sample patients (93.8%) reported measuring the value of HbA1c regularly with a duration of 6 months (mean 5.92 ±3.35, range 1-24). The value of last measurement was 8.41 ±1.81 (range 5-18) (Table 7).

Table 7: HbA1c measuring

	Frequency	Percentage (%)
Do you measure the value of HbA1C regularly?		
No	8	6.2
Yes	122	93.8
What is the duration between two measurements(in months)	**Mean:5.92 SD:3.355 Range (1-24)**	
What is the value of last measurement?	**Mean:8.41 SD:1.817 Range (5-18)**	

Adherence patterns

A large percentage of the sample patients reported forgetting to take their medications sometimes (64.6%), and (72.3%) having difficulty remembering to take all their medications. Only (16.9%) of the patient reported cutting back their medications when they felt better or worse. Although sticking to the treatment plan was considered as inconvenient by (63.1%) of patients, only (24.6%) reported forgetting their drugs at home when leaving. (17.7%) reported not taking their drugs on the day prior to the interview, (30%) in the previous 2 weeks.

The mean 8-MMMAS of the sample was found to be 5 (±1.6) and ranged from 0 to 8 with a median value of 5.The value of the mean was taken as a determinant for adherence status where if the summation of the score of the 8-MMMAS questions was 0-5, the patient was considered as non adherent, and if the value was 6 and beyond, the patient being adherent.

64.60% of the sample was classified as adherent, and 35.40% are known to be non-adherent (Table 8).

Table 8: 8-MMMAS Answers

Question	Yes	No
1- Do you sometimes forget to take your pills?	64.6 %	35.4 %
2- People sometimes miss taking their medications for reasons other than	30%	70 %

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine?		
3- Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	10 %	90 %
4- When you travel or leave home, do you sometimes forget to bring along your medications?	24.6 %	75.4 %
5- Did you forget to take your medications yesterday?	17.7 %	82.3 %
6- When you feel like your disease is under control, do you sometimes stop taking your medicine?	16.9%	83.1 %
7- Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	63.8%	36.2 %
	Sometimes/Often/Always	**Never/Rarely**
8- How often do you have difficulty remembering to take all your medications?	72.3%	27.7%
	Adherent	**Non-Adherent**
MMMAS percentage	64.6%	35.4 %

Comparison between adherent and non adherent patients

Sociodemographic characteristics did not seem to predict the variation of adherence, as none of which showed any significance in Chi-square test (Table 9)

Table 9: Comparison between adherent and non adherent patients concerning sociodemographic predictors

Predictor	**Non-adherent (%)**	**Adherent (%)**	**P-value**
Sex			
Males	47.7	60.5	
Females	52.3	39.5	0.166

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Educational Level:			
Illiterate	31.8	23.3	
Elementary	47.7	41.9	
Intermediate	18.2	15.1	
Secondary	0	11.6	
University	2.3	8.1	0.071
Marital Status:			
Single	0	9.3	
Married	90.9	80.2	
Divorced	6.8	3.5	
Widowed	2.3	7	0.078
Employment status:			
Unemployed	56.8	39.5	
Employee	27.3	37.2	
Self-employed	15.9	23.3	0.172
Daily break:			
No	63.6	50	
Yes	29.5	44.2	
Missing	6.8	5.8	0.280
Monthly income:			
[500000-1000000]	77.3	67.4	
[1000000-2000000]	18.2	20.9	
>2000000	4.5	11.6	0.377
Care provider at home:	56.8	64	
No	43.2	36	0.429
Yes			

Concerning healthy lifestyle factors, smoking status (p=0.012) and the level of stress and anxiety (p=0.009) were found to be significantly different between adherent and non adherent patients while other factors as doing regular sports, measuring important health indicators , and adherence to a healthy diet were all not found to be significantly important predictors of high adherence (table 10).

Table 10: Comparison between adherent and non adherent patients concerning healthy lifestyle

Predictor	Non-adherent (%)	Adherent (%)	P-value
Smoking status:			
Non smoker	68.2	41.9	
Ex-smoker	22.7	32.6	
Smoker	9.1	25.6	**0.012**
Regular sports:			
No	68.2	57	
Yes	31.8	43	0.216

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Level of stress and anxiety: None Some times All the time	 0 68.2 31.8	 15.1 62.8 22.1	 **0.009**
Memory (forgetfulness) Never Sometimes All the time	 22.7 65.9 11.4	 20.9 67.5 11.6	 0.973
Do you regularly measure your BP, BS, Cholesterol, etc? No Yes	 15.9 84.1	 16.3 83.7	 0.957
Did the Dr recommend a certain diet for you to follow? No Yes	 6.8 93.2	 5.8 94.2	 1

Regarding drug related factors, neither the drug number nor the duration since administration of treatment were suggested to negatively affect the adherence level.
Medical insurance, difficulty paying for drugs and experiencing a drug related side effects were not found to be significantly different between adherent and non adherent patients.
However, statistically significant predictors of low adherence were found in monthly cost in LL (p=0.049), changing treatment plan a lot recently (0.010) and taking acute drugs (pain killer, ATB, etc) (p=0.014) (Table11).

Table 11: Comparison between adherent and non adherent patients concerning drug related factors

Predictor	**Non-adherent (%)**	**Adherent (%)**	**P-value**
Number of chronic drugs 1-4 4-8 >8	 47.7 50 2.3	 62.8 31.4 5.4	 0.107
Duration since administration of first chronic drug 6-54 54-108 >108	 58.1 23.3 18.6	 69.8 20.9 9.3	 0.265
Monthly cost in LL 8000-200000	 70.5	 87.2	

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

200000-400000 >400000	25 4.5	11.6 1.2	 **0.049**
Medical insurance No Yes	 38.6 61.4	 54.7 45.3	 0.084
Difficulty paying for drugs No Yes	 70.5 29.5	 66.3 33.7	 0.630
Ever experienced a drug related side-effect? No Yes	 72.7 27.3	 81.4 18.6	 0.255
Did your treatment plan change a lot recently? No Yes	 90.9 9.1	 70.9 29.1	 **0.010**
Do you take any acute Drugs (pain killer, ATB, etc) No Yes	 6.8 93.2	 24.4 75.6	 **0.014**

With respect to patient beliefs, patients who believed they are over-medicated, who thought they could skip and double doses, who usually postpone physician's appointments , who would stop the treatment based on others' advice and who don't think that drug therapy will improve their condition were not found to have significantly lower adherence rates (Table 12).

Table 12: Comparison between adherent and non adherent patients concerning patents' beliefs

Predictor	Non-adherent (%)	Adherent (%)	P-value
Do you think you are over-medicated? No Yes	 61.4 38.6	 59.3 40.7	 0.820
A person can take double the dose to feel better or skip a dose if he felt worse No Yes	 88.6 11.4	 94.2 52.3	 0.327
Do you usually postpone doctor's appointments? No Yes	 38.6 61.4	 47.7 53.6	 0.300

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

If someone you trust advised you to stop your treatment, would you?			
No	88.6	91.9	
Yes	11.4	8.1	0.53.9
Do you believe that drug therapy will improve your condition?			
No	11.4	5.8	
Yes	88.6	94.2	0.305

In addition good drug knowledge, positive physician-patient relationships, appropriate physician counseling, understanding how to take their medications, explaining the disease to them by physician, teaching them how to take the drugs properly, and asking them about their previous medications, as were supposed to be predictors of good adherence, were not significantly different between adherent and non-adherent patients (Table 13).

Table 13: Comparison between adherent and non adherent patients concerning relationship with healthcare providers

Predictor	**Non-adherent (%)**	**Adherent (%)**	**P-value**
Did the Dr discuss with you the disease and its severity?			
No	9.1	8.1	
Yes	90.9	91.9	1
Did the Dr ask you about drugs you are already taking before prescribing new one?			
No	6.8	8.1	
Yes	93.2	91.9	1
Did the Dr explain to you how to take your medications?			
No	6.8	8.1	
Yes	93.2	91.9	1
Did you fully understand how to take them?	4.5	8.1	
No	95.5	91.9	0.717
Yes			

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

Did the Pharmacist explain to you how to take your medications? No Yes	 6.8 93.2	 3.5 96.5	 0.406
Did you fully understand how to take them? No Yes	 4.5 95.5	 2.3 97.7	 0.604

On the other hand, statistically significant predictors of low adherence included most important reason that would make them stop taking their drug (mainly forgetfulness) (p=0.009), forgetting to take their pills (p<0.001), taking their medicine over the past two weeks (p<0.001), cutting back or stop taking their medication without telling their doctor, because they felt worse when they took it (p<0.001), forgetting to bring along their medications during traveling (p<0.001) (Table 14).

Table 14: Comparison between adherent and non adherent patients concerning remembering their medications

Predictor	**Non-adherent (%)**	**Adherent (%)**	**P-value**
What is the most important reason that would make you stop taking your drug Drug cost Forgetfulness Regimen too complicated Nothing would make me stop	 13.6 56.8 4.5 25	 19.8 29.1 2.3 48.8	 **0.009**
Do you sometimes forget to take your pills No Yes	 9.1 90.9	 48.8 51.2	 **<0.001**
Were there any days when you did not take your medicine over the past 2 weeks? No Yes	 45.5 54.5	 82.6 17.4	 **<0.001**
Have you ever cut back or stopped			

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

taking your medication without telling your doctor, because you felt worse when you took it? No Yes	 75 25	 97.7 2.3	 **<0.001**
When you travel or leave home, do you sometimes forget to bring along your medications? No Yes	 45.5 54.5	 90.7 9.3	 **<0.001**
Did you forget to take your medications yesterday? No Yes	 18.2 81.8	 17.4 82.6	 0.917

Stop taking their medicine when they feel that the disease is under control ($p<0.001$), feeling disturbed taking medication everyday ($p<0.001$), difficulty remembering to take all their medications ($p<0.001$) were also shown to be significantly different (Table 15).

In addition, results showed no significant difference neither regarding HbA1c measuring regularly nor its value .Only 19.6% of the adherent patients known to be within the normal range of HbA1c value which was not significantly different with non adherent patients (Table 15).

Table 15: Comparison between adherent and non adherent patients concerning feeling disturbed and HbA1c measuring

Predictor	**Non-adherent (%)**	**Adherent (%)**	**P-value**
When you feel like your disease is under control, do you sometimes stop taking your medicine? No Yes	 59.1 40.9	 95.3 4.7	 **0.000**
Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan? No Yes	 6.8 93.2	 51.2 48.8	 **0.000**

Technium Social Sciences Journal
Vol. 37, 375-395, November, 2022
ISSN: 2668-7798
www.techniumscience.com

How often do you have difficulty remembering to take all your medications? Never/rarely Sometimes/often/always	 4.5 95.5	 39.5 60.5	 **0.000**
Do you measure the value of HbA1c regularly? No Yes	 6.8 93.2	 5.8 99.2	 1
HbA1c value Within normal range Outside normal range	 16.7 83.3	 19.6 80.4	 0.679

Our sample was considered to be highly adherent to treatment (64.6%) where the main cause of non-adherence in non-adherent patients was forgetfulness, where there was no other reason that makes patient stop his drug other than forgetting it.

Discussion

Our study aimed to evaluate the level of adherence in Lebanese adult outpatients suffering from diabetes mellitus, where they may present other illness and to identify the possible predictors of non-adherence in this patient group.

Yet the analysis of the possible predictors highlighted many major issues. None of the socio-demographics significantly affected the adherence level; many previous studies have found similar results [13, 14, 22].

Even though half of the patients had no medical insurance and about 67.7% of them had a difficulty in paying for drugs, this presumption did not stand upon data analysis. Neither drug cost per patient, nor the presence of a medical insurance could predict the adherence outcome in our patient group. This finding is supported by a lot of evidence from the literature where drug cost fails to be a major predictor relative to other more important criteria [23].

In addition, although a good physician-patient relationship and proper counseling by the physician had an effect in increasing the level of adherence in chronically ill patients, but the difference was not significant [8, 22, 24, 25].

Data suggest that the patient should be ‘engaged’ in the treatment plan rather than just ‘counseled’ about their drugs. It is very crucial that the physician takes into account the individual preference of patients when prescribing new medications and to involve the patient in the decision-making. This communication is especially important in older patients with multiple diseases and hence multiple drugs or ‘poly pharmacy’ [8, 22, 24, 25].

Declining memory was found to be the most major predictor of adherence in our sample. This can be associated with the idea that in older patients, declining cognitive function plays a major role in their drug intake [13]. These patients are more likely to forget to take their medications and also forget the physician’s instructions. So even if proper counseling is assumed, it will have a transient effect because none of the information will be retained by the patient. This problem can be overcome by the use of different aids. The use of clear labels and encouraging the patient to use reminders are helpful techniques to combat this problem. The physician should work with the patient on simplifying the drug regimen. Blistered medications

which divide doses over the day and week can help a great deal in remembering to take medication in appropriate doses and time-intervals. The physician should also work on simplifying the drug regimen through omitting any unnecessary medication. The number of pills per day and dose frequency can be reduced by using fixed dose combinations [8, 16].

A meta-analysis on the use of fixed-dose combination concluded that a 26% decrease in the risk of non-adherence is associated with the use of these combinations [18]. Overall it is believed that patients adhere better to once-daily medications rather than three or four-times-daily drugs, as they find it more convenient and appropriate with their daily activities [17].

Patients should be educated therapeutically about their treatments; the physician plays an important role in such an issue.

The physician with the aid of clinical pharmacist should create methods and apply ways that help in increasing the knowledge of patients about their treatment; they also should urge the patients and help them in remembering their drugs in the precise time and in the correct way.

The belief that treatment will not improve the condition was significantly related to low adherence levels. Also stopping therapy without telling the doctor because of feeling worse, feeling the disease is under control and feeling disturbed about sticking to their treatment, all were shown to be significantly different between adherent and non-adherent patients.

Such results highlight the importance of explaining for patients about the side effects and sequels that would happen without taking their medication. Patients may not be aware about the importance of treatment in preventing many hazards from occurrence.

Healthcare providers should act together inorder to overcome this problem and thus by doing such a step, many problems will be avoided.

The value of HbA1C was not shown to be significantly different between adherent and non adherent patients which reflect the fact that a fluctuations in the patient's answers had occur and an overestimation of the adherence level.

Patients may not say the truth about their use of drugs and adherence to treatment regimen, and in our study we did not ask patients about details that may help us in estimating adherence rather than depending on them only as a source of information

It is important to note that this study has several limitations. The method of drug adherence was self-report which suggests a possibility of recall bias. Self-report when compared to other methods of drug adherence assessment is generally believed to overestimate adherence level [26, 27].

But yet self-report is still believed by many to be equally precise as other physical methods such as pill-count or electronic monitoring [28].

Another limitation is that the study did not compare between patients according to disease severity, disease type, or drug class. These factors were recently believed to be less significant when compared to other patient related factors such as patient attitudes or beliefs [20, 29].

Conclusion

This study focused on many issues concerning drug adherence in Lebanese diabetic outpatients. Although the studied sample was considered as highly adherent, the findings reassure the fact that patients should be frequently reminded of their treatment by several ways - like encouraging patients to use memory aids - as forgetting was shown to be the major reason of non-adherence.

As diabetes was called “the silent killer disease”, patient’s education should be regarded as a cornerstone for treatment success. Teaching them about the importance of the treatment and the severe consequences of their disease that may persist if they cut back their therapy because of feeling worse, unimproved or feeling disturbed, will motivate patients to take drugs as instructed.

So, when patients realize and understand the necessity of their treatment and the consequences of under-treatment, their beliefs will be totally changed about their therapy. Physicians and pharmacists shall put more effort in identifying patients with declining memory and try to help them take their medications sufficiently and on time, they also should make an effort in educating patients and explaining for them about their disease and the importance of taking the proper treatment on time to avoid future hazards.

More studies that assess adherence and predict factors affecting this adherence are needed to provide strong evidence on those barriers. Additional studies as well are needed to highlight the effectiveness of interventions suggested to aid and improve adherence.

References

[1] International Diabetes Federation. Diabetes atlas. 3. Brussels, Belgium: International Diabetes Federation; 2006.
[2] UK Prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998; 352:837-53.
[3] Zimmet P, Alberti KG, Shaw J. Global and societal implications of the diabetes epidemic. Nature. 2001; 414:782–7.
[4] Rubin Richard R. Adherence to pharmacologic therapy in patients with Type 2 diabetes mellitus. Am J Med. 2005; 118:27S–34S.
[5] Rhee MK, Slocum W, Ziemer DC, et al. Patient adherence improves glycemic control. Diabetes Educ. 2005; 31:240–50.
[6] Krapek K, King K, Warren SS, et al. Medication adherence and associated hemoglobin A1C in type 2 diabetes. Ann Pharmacother. 2004; 38:1357–62.
[7] Cramer, J., Roy, A. et al. Medication compliance and persistence: terminology and definitions. Value In Health.2008; 11: 44-47.
[8] Laufs, U., Rettig-Ewen, V. and Bohme, M. Strategies to improve drug adherence. European Heart Journal.2011; 32: 264–68.
[9] Sokol, M., McGuigan, K. et al. (2005). Impact of medication adherence on hospitalization risk and healthcare cost. Med Care, 43 : 521–30
[10] Atella, V. Peracchi, F. et al. Drug compliance, co-payment and health outcomes: Evidence from a panel of Italian patients. Health Econ.2006; 15 : 875–92.
[11] Sabaté E, ed. Adherence to Long-Term Therapies: Evidence for Action.Geneva, Switzerland: World Health Organization; 2003.
[12] Thunander Sundbom, L. and Bingefors, K. Women and men report different behaviours in, and reasons for medication nonadherence: a nationwide Swedish survey. Pharmacy Practice.2012; 10(4) : 207-21.
[13] Dunbar-Jacob, J. and Mortimer Stephens, M.K. Treatment adherence in chronic disease. Journal of Clinical Epidemiology.2001;54 : S57–S60.
[14] Horne, R. and Weinman, J. Patients’ beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. Journal of Psychosomatic Research. 1999; 47(6) : 555–67

[15] Fincke, B., Miller, D. and Ill, A. The interaction of patient perception of overmedication with drug compliance and side effects. J Gen Intern Med.1998;13 : 182-85.
[16] Claxton, A., Cramer, J. and Pierce, C. A systematic review of the associations between dose regimens and medication compliance. Clinical Therapeutics.2001; 23(8): 1296-1310
[17] Coleman, C., Limone, B. et al. Dosing frequency and medication adherence in chronic disease. Journal of Managed Care Pharmacy.2012; 18(7): 527-39.
[18] Bangalore, S., Kamalakkannan, G. et al. Fixed-dose combinations improve medication compliance: A meta-analysis. The American Journal of Medicine.2007; 120: 713-19.
[19] Shrank, W., Hoang, T. et al. The implications of choice: Prescribing generic or preferred pharmaceuticals improves medication adherence for chronic conditions. Arch Intern med.2006; (166) : 332-37.
[20] Briesacher, B., Andrade, S. et al. Medication adherence and the use of generic drug therapies. Am J Manag Care.2009; 15(7) : 450–56.
[21] Hovstadius, B. and Petersson, G. Non-adherence to drug therapy and drug acquisition costs in a national population - a patient-based register study. BMC Health Services Research.2011;11 : 326-36.
[22] Moore, T, Neher, J. and Safranke, S. Improving medication adherence in patients with comorbidities. American Family Physician.2011; 84 (7).
[23] Rolnick, J., Pawloski, P. et al. Patient characteristics associated with medication adherence. Clinical Medicine & Research.2013; 11(2): 54-65.
[24] Gold, D. and McClung, B. Approaches to patient education: Emphasizing the long-term value of compliance and persistence. The American Journal of Medicine. 2006; 119 (4A):32S-37S.
[25] DiMatteo, M., Reiter, R. and Gambone, J. Enhancing medication adherence through communication and informed collaborative choice. Health Communication. 1994; 6(4): 253-65.
[26] Garber, M., Nau, D. et al. The Concordance of Self-Report With Other Measures of Medication Adherence: A Summary of the Literature. Medical Care.2004; 42 : 649–52.
[27] Voilsa, C., Hoyle, R. et al. Improving the measurement of self-reported medication nonadherence. J Clin Epidemiol.2011; 64(3) : 250–54.
[28] Grymonpre, R., Didur, C. et al. Pill count, self-report, and pharmacy claims data to measure medication adherence in the elderly. Ann Pharmacother.1998; 32 : 749-54.
[29] Glombiewski, J., Nestoriuc, Y. et al. Medication adherence in the general population. PLoS ONE.2012; 7(12) : e50537.