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Anti-Diabetic Medication Adherence and Glycemic Control Among Patients With Diabetes Mellitus in Najaf, Iraq

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Abstract: **Background:** Lack of adherence to anti-diabetic drugs is related with poor glycemic-control and sub-optimal profits from their given drugs which causes insignificant control of blood sugar between diabetic patients and can result in failure of treatment, enhanced development of complications and augmented mortality. **Objective:** The following study aimed to evaluate adherence to antidiabetic drugs among diabetic patients and associated factors in Annajaf Community-Iraq. **Methods:** A "cross sectional study" was conducted among 380 diabetic patients at Al-Hakeem center for diabetic patients at Annajaf governorate in Iraqi. The patients ages were $\leq$18 years who have been administered anti-diabetic medication for as a minimum three months. Pretested questionnaires have been used. Variables that have been gathered were covered socio-demographic characteristics. Adherence was assessed the usage of Iraqi anti-diabetic medicine adherence scale. Inferential and descriptive statistic have been analyzed achieved to calculate adherence level to anti-diabetic drugs and the related factors. **Results:** The level of adherence to anti-diabetic drugs was 71.8% whom highly adherent, while non-adherent [intermediate adherence was 84(22.1%) and low adherence 23(6.1%)]. When univariate analysis was done, the age, smoking status, life style, type of antidiabetic, HbA1C, education, duration of Disease, and no. of comorbidities were showed chi-squared test statistical significance with level of adherence, while by multivariate analysis, the type of antidiabetic, education, and no. of comorbidities were showed statistical significance with level of adherence. **Conclusion:** About three in each four patients were well adherent to anti-diabetic therapy. Many strategies designed to refining the availability of anti-diabetic medications and supplying health education which might increase the adherence level.

Key Words: adherence, "diabetes mellitus", anti-diabetic medication, "glycemic control"

1. INTRODUCTION

Diabetes is a multifaceted illness that requires constant attention to diet regime, exercise, medication and glucose monitoring to reach a good glycemic control. Adequate control of continual disease is problematic. Patients are regularly required to take one or extra medicines over the complete lifetime of the disease [1]. The occurrence of diabetes mellitus global changed into 451 million human beings in 2017 and is estimated to rise to 693 million through 2045 [2]. The utmost common form is "diabetes mellitus type 2" (T2DM), accounting for 90%–95% of cases [3].

However, the "World Health Organization"(WHO) has certified the term adherence for use in chronic diseases as "the extent to which a person's behavior—taking medication, following diet, and/or executing lifestyle changes—corresponds with agreed recommendations from a health care provider" [4]. The T2DM incidence is quickly increasing, in large part in older, obese sufferers who've associated cardiovascular risks [5]. Though, health care structures regularly do now no longer have ok assets to offer help to people with continual diseases. Difficulties with bad self-control of treatment may also worsen the burden of diabetes [6]. Low adherence residues a barrier to best medical care for patients with diabetes mellitus (DM) [7]. A systematic review establish that only 56.2% in diabetic patients(T2DM) sustained on their treatment one year after initiation of treatment [8]. The

adherence to injectable drugs are even lower. The insulin glargine persistence rate in the first year after starting of treatment is under 50% [9]. Furthermore, low adherence to antidiabetic drugs rises healthcare costs and reduces quality of life [10], [11].

The causes of low adherence to medications of DM are multi-factorial [12]. The WHO categorized reasons for medication non-use into five categories: medication-related (e.g., adverse effects), health-system-related (e.g., level of continuity of care), condition-related (e.g., presence of complications), socioeconomic (e.g., medication costs) and patient-related (e.g., age) [13].

Correspondingly, stimulations behindhand medication non-use in diabetic patients on injection treatment are complicated. Unsuccessful communiqué between patients and clinicians, insufficient knowledge about drugs, and unclear directions for drugs use concurrently weaken treatment progressions [14]. Furthermore, the classes of antidiabetic drugs impact the persistence and adherence to the therapy of DM [15], [16].

In this study, we evaluated the factors related with adherence to DM medications in Annajaf-Iraq, so as to director the interventions for enhancing adherence of DM medications to achieve optimal glycemic control between patients with diabetes in this area.

2. METHODS

This study was done in a 5-month, started from April until August 2023 at Al-Hakeem center for diabetic patients in Al-Sadder Medical city which operate out-patient's diabetic clinics once visit every three months. The study assumed as "cross-sectional research design" and for data collection a questionnaire survey method was used. The study was directed by patients attend to the center at planned times for constant consultation and monitoring concerning their disease. Medicinal care is providing throughout each visit and all patients take free medical care with drugs and laboratory tests when obtainable.

2.1. STUDY RESPONDENTS AND DATA COLLECTION

Respondents who have diabetes, aged $\leq$ 18, presenting the diabetic center who offered well-versed consent to contribute in the study. The outcomes were data recorded in questionnaires from these the level of adherence to anti diabetic drugs and the related factors were measured. A total of 380 patients who reported on diabetic center days. Pretested semi-structured questionnaires were used by trained interviewers collect information on: gender, education level, age, marital status, BMI, smoking status, life-style, HbA1c level, monthly income, type of diabetes, duration of disease and number of comorbidities.

2.2. CALCULATION OF ADHERENCE TO ANTI DIABETIC DRUGS

As WHO defined the adherence by the patients taking the medication, maintaining a lifestyle and perceive the medical recommendations as suggested by physicians. In this study, we directed on medication adherence. In total, the IADMAS consists of 10 items were used to straight measure medication-taking behavior by giving five responses: "(1) always (daily), (2) often, (3) sometimes, (4) rarely and (5) never". Respondents were exactly asked to remember if they wasted any doses of drugs on a day-by-day basis during a period of one month ago. The wasted number of doses was recorded basing on the patient's medication program which was achieved from their medical records. IADMAS considered that patients who administered $\leq$ 80% of the given doses over one month as adherent to anti-diabetic drugs [17], [18].

* The high adherence level take a score of 8-10, intermediate adherence level take a score 6-7.75 and low adherence level take a score 0-5.75 [19]. IADMAS: Iraq Antidiabetic Medication Adherence Scale"."

Alternatively, as stated by the "American Diabetes Association guidelines", the normal HbA1C level for adults is less than 7.0%. But this can vary rendering to different conditions. In this study, patients were classified into two glycemic control groups: good control (HbA1C < 7%) and poor control (HbA1C $\leq$7) [20], [21].

2.3. DATA MANAGEMENT AND ANALYSIS

The data in current study were analyzed using SPSS version 20 and attended using "descriptive statistics", such as numbers, and percentages. The chi-squared test were used to analyze categorical data and associations between categorical variables. In the multivariate analysis, independent factors were stated through a logistic regression analysis with gradual eradication method while keeping known predictors of adherence from literature. P-values less than 0.05 were regarded significant.

2.4. SAMPLE SIZE PLANNING

The size of sample was designed by refering the "Raosoft website" with an established margin of error of 5%, level of adherence of 64.3%, and "confidence level of 95%". The planned size of sample was 380 patients.

2.5. ETHICAL DELIBERATIONS

Ethical approval to handle this study was gained from the ethical committee of the medical University of Jabbir ibn Hayyan. Oral well-versed consent was achieved from study participants.

3. RESULTS

3.1. RESPONDENTS' CHARACTERISTICS

A total of 380 diabetic patients were questioned of whom 240(63.2%) were male and 140(36.8 %) were female. The most patient age was 55 or over. The distribution of BMI was 8(2.1%) were underweight, 106(27.9%) were normal weight, 154(40.5%) were overweight and 112(29.5%) were obese. About 84(22.1%) are smokers while 296(77.9%) are non-smokers. Approximately 329(86.5%) were married,

No	Item	Always	Often	Sometimes	Rarely	Never
Q1	"During the last month, how many times did you forget to take your medication(s)?"	0	0.25	0.5	0.75	1
Q2	"During the last month, how often did you take your medications deliberately in a dose different than what was prescribed for you?"	0	0.25	0.5	0.75	1
Q3	"During the last month, how often did you take your medications deliberately at a different time than was prescribed for you?"	0	0.25	0.5	0.75	1
Q4	"During the last month, did you stop taking your medication(s) without seeking medical consultation because of side effects?"	0	0.25	0.5	0.75	1
Q5	"During the last month, did you take lesser amounts of your medication(s) without seeking medical consultation because you felt better?"	0	0.25	0.5	0.75	1
Q6	"During the last month, did you take your medication(s) in lesser amounts because it was expensive?"	0	0.25	0.5	0.75	1
Q7	"During the last month, how often do you decide not to take your medicine?"	0	0.25	0.5	0.75	1
Q8	"During the last month, "how often do you miss taking your medicine because you feel better?"	0	0.25	0.5	0.75	1
Q9	"During the last month, how often do you decide to take less of your medicine?"	0	0.25	0.5	0.75	1
Q10	"During the last month, how often do you forget to bring along your medicine when you travel away from home?"	0	0.25	0.5	0.75	1

TABLE 1: Determining adherence level by using the IADMAS*

but 51(13.5%) were single. Regarding education there was 78(20.5%) were not educated, 101(26.6%) were primary school, 63(16.6%) were intermediate school, 61(16.1%) were secondary, 55(14.5%)were tertiary school and 22(5.8%)were post-graduated.

According to life-style, the distribution as 247(65%) were sedentary(inactive) and 133(35%) whom were active. Type of antidiabetic was as 261(68.7%) were taking oral hypoglycemic agents, 66(17.4%) were taking insulin and 53(13.9%) were taking both. Whereas the HbA1c as 59(15.5%) were below 7 and 321(84.5%) equal or more than 7.

The monthly income distributed as 40(10.5%) were low income, 236(62.1%) were lower-middle income, 90(23.7%) were upper-middle income and 14(3.7%) were high income. However, the Type of diabetes 77(20.3%) were type I and 303(79.7%) were type II. Duration of Disease were distributed as 114(30.0%) were below 5 years and 266(70.0%) were equal or more than 5 years. Lastly the number of comorbidities were distributed as 175(46.1%) whom have no disease, 138(36.3%) whom have 1 disease, 34(11.3%) whom have 2 disease, 14(3.7%) whom have 3 disease, and 10(2.6%)whom have 1 disease. Table 2.

3.2. ANTI-DIABETIC MEDICATION ADHERENCE

Of the 380 participants 273(71.8%) were well-adherent to anti diabetic drugs based on an IADMAS, 84(22.1%) were intermediate adherence and 23(6.1%) were low adherence level. Table 3.

IADMAS: Iraqi anti-diabetic medication adherence scale Respondents' sociodemographic characteristics such as sex, BMI, marital status, monthly income and type of diabetes were not related with adherence to anti-diabetic medications. Table 4

When univariate analysis was done, the age, smoking status, life style, Type of antidiabetic, HbA1C, Education, Duration of Disease, and No. of comorbidities were showed chi-squared test statistical significance with level of adherence as (X^2=21.23; p-value 0.002), (X^2=9.13; p-value 0.009), (X^2=40.31; p-value 0.000), X^2=17.36; p-value 0.002, X^2=16.70; p-value 0.000, X^2=30.41; p-value 0.001, X^2=13.14; p-value 0.001 and X^2=32.01; p-value 0.000 respectively. Table (4). While by multivariate analysis, the gender, smoking status, lifestyle, type of antidiabetic, and No. of comorbidities were showed statistical significance with level of adherence as (p-value 0.000), (p-value 0.031), and (p-value 0.000), (p-value 0.012) and (p-value 0.022) respectively Table 5.

4. DISCUSSION

In this study, overall level of adherence to antidiabetic medications was high in Najaf governorate (about 71.8%). About three in every four respondents were well-adhered to their diabetic medication based IADMAS [19]. Adherence evaluates vary extensively between studies (43%–86%), depending on adherence definition and target population [22].

Similar adherence rates have been stated before USA [6], China [23], Scotland [17], and Palestine [24]. However, the adherence low rates to anti-diabetic medications have also been recorded in Saudi Arabia, Korea and Malaysia [18], [25], [26].

The inconsistency in adherence rate might be belonging to variances in metrics to evaluate adherence, and modifications in health carefulness settings. Regarding to this study, patients obtain free anti-diabetic medications while in other countries like Korea, Malaysia and India, patients have to pay for their drugs and therapeutic consultations. These supplementary financial charges may discourage or delay patients from re-filling recommended medication and this adversely influences on their adherence directly. Secondly the high costs of the recommended OHA particularly the relatively newer agents or shortage of suggested brands of drugs, deters the optimal adherence additionally [23], [27]. Monetary costs related with diabetic care expressively lessen

Variable	N(%)
\textbf{Age}	∼
35	39(10.3%)
36-45	59(15.5%)
46-55	86(22.6%)
55	196(51.6%)
Gender	∼
(Male)	240(63.2%)
(Female)	140(36.8 %)
BMI	∼
Underweight	8(2.1%)
Normal	106(27.9%)
Overweight	154(40.5%)
Obese	112(29.5%)
Smoking status	∼
Yes	84(22.1%)
No	296(77.9%)
Lifestyle	∼
Sedentary	247(65%)
Active	133(35%)
Type of antidiabetic	∼
OHA	261(68.7%)
Insulin	66(17.4%)
OHA+ insulin	53(13.9%)
HbA1c	∼
7	59(15.5%)
7≤	321(84.5%)
Education	∼
None	78(20.5%)
Primary	101(26.6%)
Intermediate	63(16.6%)
Secondary	61(16.1%)
Tertiary	55(14.5%)
Postgraduate	22(5.8%)
Marital status	∼
Single	51(13.5%)
Married	329(86.5%)
Monthly income	∼
Low	40(10.5%)
Lower-Middle	236(62.1%)
Upper-Middle	90(23.7%)
High	14(3.7%)
Type of diabetes	∼
Type 1	77(20.3%)
Type 2	303(79.7%)
Duration of Disease	∼
5	114(30.0%)
5≤	266(70.0%)
No. of comorbidities	∼
None	175(46.1%)
1	138(36.3%)
2	34(11.3%)
3	14(3.7%)
4	10(2.6%)

TABLE 2: the sociodemographic data of diabetic patient (n=380)

Adherence	IDMAS
Low (0-5.75)	23(6.1%)
Intermediate (6-7.75)	84(22.1%)
High (8-10)	273(71.8%)

TABLE 3: The distribution of adherence in sample (n=380)

contact to anti-diabetic medications and therefore impact patient's adherence in developing countries [27]–[29].

The leading causes for non-adherence to anti-diabetic medications amongst Iraqi patients were forgetfulness, the disease symptoms were disappeared, carelessness, side effects of anti-diabetic medications, high medication cost, going outside home, reduced appetite during sick days and some social misconceptions about management of diabetes [19].

Regarding age, the patients whom more than or equal to 55 years have higher rate of adherence than others and this may be attributable to fear from deterioration of their health conditions and complication. Moreover, a probable description for the well adherence between the aged patients is that they are more well-informed and skilled with using the medications. Though, with increasing age and encumbrance of disease, adherence come to be more difficult to sustain over time. The finding of an relationship between age and adherence to OHAs has assisted to classify younger diabetic patients as a liable group requiring intercession to improve adherence [30]. So this result is consistent with previous studies in Saudi Arabia, Hawaii and Ghana [31]–[33]. On other hand, another study in Egypt showed inconsistent results with this study [34]. Meanwhile age was showed no significance in multivariate analysis so this result was consistent with cross-sectional study in Saudi Arabia [35].

There was no significant difference in the adherence level in both gender groups with univariate analysis, same results obtained from previous studies in Egypt and Saudi Arabia [34], [35] but in multivariate analysis was showed that male had highly significant (P- value 0.000) and this result was consistent with a hospital-based cross-sectional study in Nepal [36] while it was inconsistent with other two studies in Saudi Arabia [31], [35].

In both univariate and multivariate analysis, the non-smokers have higher rate of adherence to antidiabetic medication than smokers. Other two studies in Iran showed better adherence level in diabetic non-smokers than smoker [37], [38]. But the following studies in Saudi Arabia have different results [31], [35].

Lifestyle modifications are vital for decreasing diabetes-associated morbidities and mortalities plus glycemic control. Adherence to a normal lifestyle and exercising was linked with a reduced mortality rate of 57% for diabetics. In this study, the sedentary patients have higher adherence rate than active patients in both univariate and multivariate analysis. This can be explained that regular exercises may improve diabetic control and use of anti-diabetic medications may predispose recurrent hypoglycemic attacks, therefore patients may reduce their medications. Some studies in Germany and Sweden may support our findings [39], [40] while others in Saudi Arabia do not [31], [35].

Based on types of medications, the patients taking OHA having higher adherence rate than patient taking insulin alone or both and this may be to high palatability of patients to OHA more than insulin as injection and its administration

Variable	N=380 (100%)	Adherence			X^2 (X^2)	P-value
		High	Intermediate	Low		
Age						
<35	39(100%)	27(69.2%)	11(25.2%)	1(2.6%)	21.23	0.002
36-45	59(100%)	31(52.5%)	21(35.6%)	7(11.9%)		
46-55	86(100%)	59(68.6%)	23(26.7%)	4(4.7%)		
>55	196(100%)	156(79.6%)	29(14.8%)	11(5.6%)		
Gender						
(Male)	240(100%)	177(73.8%)	51(21.3%)	12(5.0%)	1.738	0.419
(Female)	140(100%)	96(68.6%)	33(23.6%)	11(7.9%)		
BMI						
Underweight	8(100%)	7(87.5%)	1(12.5%)	0(0.0%)	9.644	0.140
Normal	106(100%)	69(65.1%)	31(29.2%)	6(5.7%)		
Overweight	154(100%)	107(69.5%)	37(24.0%)	10(6.5%)		
Obese	112(100%)	90(80.4%)	15(13.4%)	7(6.3%)		
Smoking status						
Yes	84(100%)	51(60.7%)	23(27.4%)	10(11.9%)	9.138	0.009
No	296(100%)	222(75.9%)	61(20.6%)	13(4.4%)		
Lifestyle						
Sedentary	247(100%)	202(81.8%)	34(13.8%)	11(4.5%)	34.892	0.000
Active	133(100%)	71(53.4%)	50(37.6%)	12(9.0%)		
Type of antidiabetic						
OHA	261(100%)	173(66.3%)	72(27.6%)	16(6.1%)	17.365	0.002
Insulin	66(100%)	53(80.3%)	10(15.2%)	3(4.5%)		
OHA+ insulin	53(100%)	47(88.7%)	2(3.8%)	4(7.5%)		
HbA1c						
<7	321(100%)	242(75.4%)	59(18.4%)	20(6.2%)	16.708	0.000
7≤	59(100%)	31(52.5%)	25(42.4%)	3(5.1%)		
Education						
None	78(100%)	65(83.3%)	9(11.5%)	4(5.1%)	30.410	0.001
Primary	101(100%)	80(79.2%)	14(13.9%)	7(6.9%)		
Intermediate	63(100%)	39(61.9%)	18(28.6%)	6(9.5%)		
Secondary	61(100%)	36(59.0%)	21(34.4%)	4(6.6%)		
College	55(100%)	43(78.2%)	11(20.0%)	1(1.8%)		
Postgraduate	22(100%)	10(45.5%)	11(50.0%)	1(4.5%)		
Marital status						
Single	51(100%)	31(60.8%)	17(33.3%)	3(5.9%)	4.365	0.113
Married	329(100%)	242(73.6%)	67(20.4%)	20(6.1%)		
Monthly income						
Low	40(100%)	24(60.0%)	12(30.0%)	4(10.0%)	6.238	0.397
Lower-Middle	236(100%)	172(72.9%)	51(21.6%)	13(5.5%)		
Upper-Middle	90(100%)	68(75.6%)	16(17.8%)	6(6.7%)		
High	14(100%)	9(64.3%)	5(35.7%)	0(0.0%)		
Type of diabetes						
Type 1	77(100%)	60(77.9%)	11(14.3%)	6(7.8%)	3.651	0.161
Type 2	303(100%)	213(70.3%)	73(24.1%)	17(5.6%)		
Duration of Disease						
<5	114(100%)	68(59.6%)	34(29.8%)	12(10.5%)	13.145	0.001
5≤	266(100%)	205(77.1%)	50(18.8%)	11(4.1%)		
No. of comorbidities						
None	175(100%)	106(60.6%)	53(30.3%)	16(9.1%)	32.018	0.000
1	138(100%)	112(81.2%)	23(16.7%)	3(2.2%)		
2	43(100%)	36(83.7%)	7(16.3%)	0(0.0%)		
3	14(100%)	10(71.4%)	1(7.1%)	3(21.4%)		
4	10(100%)	9(90.9%)	0(0.0%)	1(10.0%)		

TABLE 4: The correlation between factors associated with level of adherence

required many steps are not so easy as OHA. Insulin is greatly less accessible and less reasonable compared to the OHA. Access to insulin persists deprived in numerous provinces of the world due to expensive, opposing patients to risk of severe difficulties and disease, such as amputation, blindness, and death, [41], [42]. In this study, multivariate analysis showed that type of anti-diabetic treatment affects the level of adherence. It is well known that type of antidiabetic treatment may affect the level of adherence due to many factors including cost, availability and tolerability [35], [36], [43].

Adherence to diabetic drugs was found to be clearly related with a reduction in HbA1C [29], [44]. French and Saudi studies displayed that enhanced adherence to anti-diabetic drugs was linked with better glycemic control [45]. These results prove that patients with low adherence display poor glycemic control. In this study, poor glycemic control (HbA1C $\leq$7%) was testified more than one sixth of applicants (15%). There was a statistically significant relationship between the IADMAS categories (high, intermediate, low adherence) and HbA1C in the univariate analysis. Participants with HbA1C

Variable	S.E	P-value
Age	0.150	0.363
Gender	0.319	0.000
BMI	0.026	0.518
Smoking status	0.327	0.013
Life style	0.294	0.000
Type of antidiabetic	0.321	0.012
HbA1c	0.343	0.251
Education	0.100	0.184
Marital status	0.419	0.272
Monthly income	0.214	0.583
Type of diabetes	0.468	0.958
Duration of disease	0.497	0.407
Number of associated comorbidities	0.168	0.022

TABLE 5: Multivariable analysis of the association between adherence level and sociodemographic and clinical factors among patients with diabetes

$\leq$7 had a low adherence level and participants with HbA1C < 7% were more likely to have high adherence. The study revealed that good blood glucose control of HbA1C < 7% was higher between high adherent patient compared with other non-adherent counterparts. But HbA1C was not significant multivariate analysis and this result was agreed with study in Saudi Arabia [35] and disagreed with study in France [43].

Based on education level, the patients whom ignorant had higher rate of adherence than whom highly educated and this result was agreed with this study in Ghana [33] but disagree with following studies Egypt and Saudi Arabia [34], [35] while in multivariate analysis the education showed no significance. The following study had same results in Saudi Arabia [35] and following study in Saudi Arabia had different result [31].

Regarding duration of disease, patients with elongated durations of diabetes $\leq$5 are possible to have higher adherence than whom have less than 5 years so this due they had more communications with their physicians, could have agreed their treatment better and would be self-motivated to take their therapy. It is probable that newly on treatment patients may be less responsive of their disease and are therefore more probable to be non-adherent. Otherwise, it could be that the adherence to diabetic regimen may be accountable for patients taking more than 3 years. Alike outcomes were detected from a study amongst diabetic patients in France, which displayed that patients with low adherence had been on DM medications for less than 5years. These findings was supported by Franch study [44] and not supported by Egyptian study [34], Saudi study [35]. Meanwhile, when multivariate analysis was done there was no significance with variable and this outcome was consistent with two studies Saudi Arabia [31], [35].

Regarding no. of comorbidities, the patient they have no comorbidities have higher rate of adherence than others and this may be to hopeless feeling that increases with raised number of comorbidities. A prior studies demonstrated that a low adherence in patients with several comorbidities caused by numerous drugs [46].

Consequently, comorbidities with diabetic patients generally have polypharmacy of diverse pharmacotheraputic classes. This multifaceted treatment procedure could be a crucial factor that donates toward low or non-adherence. In this study, patients who have no related comorbidities were establish to have high level of adherence. This result was like to a Malaysian study that showed that existence of comorbidities was linked with low adherence to anti-diabetic medications [26].

Alternatively, studies from Switzerland and Tanzania showed high adherence between elderly patients who are probable to have several comorbidities [47], [48]. Also the same findings were obtained in multivariate analysis and following in Saudi Arabia support our results [35].

5. LIMITATION

The present study has a some of limitations. First, the information data were established on participants' recall, so the actual and exact adherence prevalence might be less than the existing results in this study. Patients may have many problems in recalling their habits and drug-taking behaviors, but this influence was weakened by inquiring participants to recall within the previous 14 days period. The second point, the study was conducted in one center and that may limit its generalizability. Third, the connection between patients and their clinicians, affect their adherence level to anti-medication, was not involved in this study. As an outcome, a good clinician relationship with patient could be linked with better adherence and high patient gratification.

6. CONCLUSIONS

Our results revealed to only three out of every four patients were well-adhered to anti DM medications. All patients who had taken antidiabetic medication for more than 3 years were more possible to adhere to their therapy. Adherence level was highly associated with glycemic control. Consequently, many strategies should be done to increase the availability of anti-diabetic drugs, health instructions on diabetic maintenance and management may support in enhancing the levels adherence between diabetic patients.

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