Drug compliance of patients with hypertension and/or type II diabetes mellitus: a sample from PHCs in Al-Resafa, Baghdad, 2018

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ABSTRACT

INTRODUCTION: Hypertension and type 2 diabetes mellitus are common chronic diseases in the community. Patient compliance to drugs is a factor in the positive outcome of medical treatment.

OBJECTIVE: To measure drug compliance of patients with hypertension and/or type 2 diabetes mellitus visiting primary healthcare centres (PHCs), and to find an association between the level of compliance and some epidemiological factors.

METHODS: A cross sectional study with analytic element was conducted at Al-Resafa health Directorate in the first half of 2018. The targets were patients with hypertension and/or type 1 diabetes mellitus who are visiting six PHCs in Al-Resafa district in Baghdad. Drug compliance were measure by Morisky compliance scale, Pill identification test, and tablet account and then overall compliance were measure from them. Association of level of compliance with age, gender, level of education, marital status, tendency of the patient to visit other health care institutes, having health education, level of communication with healthcare providers and implication of life style modification was studied.

RESULTS: Of 300 patients enrolled, 148 patients had hypertension, 76 had type 2 diabetes mellitus, and 76 have both. Most of patients, 103(34.3%), were aged between 50-59 years. By Morisky scale 113 patients (38.43%) showed low drug compliance; however, by tablet accounts and pills identification 221 patients (75.17%) and 264 patients (89.79%) showed good drug adherence respectively. The overall good compliance was reported in 108 patients (36.73%). The level of compliance by overall scale is significantly associated with the patient's attitude to visit health institutions other than PHCCs and the effectiveness of patient-health care providers' communication.

CONCLUSION: Pill identification test shows the highest rate of good drugs complaints while Morisky scale shows the lowest. In general compliance is still poor and by overall compliance scale about two thirds of patients were incompliant.

Key words: hypertension, type 2 diabetes mellitus, drug compliance, Morisky scale, Pill identification test, tablet account.

INTRODUCTION

Non-communicable diseases are chronic in nature and may be incurable; however, early detection and proper management of such diseases can reduce morbidity and premature death and may improve the quality of life.[1] Hypertension and diabetes mellitus are good examples for these chronic diseases.

Hypertension (HT) is a major public-health challenge worldwide because of its high prevalence and concomitant risks of cardiovascular, cerebral and kidney diseases, as well as being the leading risk factor for mortality and disability globally. It affects over one billion people, and one in every three adults, whom has high blood pressure; had poor or noncompliance produce uncontrolled hypertension that will lead to more complications.[2]

Type 2 diabetes mellitus (T2DM) is a common chronic metabolic disorder,[3] and its global

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estimated prevalence will increase from 6.9 % in 2010 to 7.7 % in 2030.[4] The goals of care for patients with type 2 diabetes mellitus are to eliminate symptoms and to prevent, or at least slow, the development of complications. Micro vascular (i.e. eye and kidney disease) and Macro vascular (i.e. coronary, cerebrovascular, peripheral vascular) risk reduction is accomplished through control of blood sugar.[5]

Glycemic control largely depends on compliance with medication therapies. In fact, the most common problem in patients with diabetes is non-compliance with medications.[6,7] WHO Adherence meeting in June 2001[1] defined adherence as "the extent to which the patient follows medical instructions". A number of rigorous reviews have found that, in developed countries, adherence among patients suffering chronic diseases averages only 50%. This is assumed to be even higher in developing countries given the paucity of health resources and inequity in access to health care.[8] Many factors are involved in patient non-adherence : factors related to the characteristics of the disease, medication side effects, duration of treatment, frequency of expected intake, complexity of treatment, and severity of the disease.[9]

Drug compliance is very important topic and has been studied many times nationally and internationally; however, the results are diverse depending on the scale used to measure the compliance, the target of patients involved in the study, and some other sociocultural factors related to each community. In this study we aimed at measuring the compliance of Iraqi patients who are suffering from hypertension and type 2 diabetes mellitus and visiting primary healthcare centres (PHCs) in Al-Resafa district in Baghdad and to find any factors that may associate the level of compliance.

METHODS

Settings and study design: A cross-sectional study with analytic element was conducted at six primary healthcare centres (PHCs) in Al-Resafa Sector: Bab Al-Moadhum, Mustansiriya, Al-Edresi, Babel, Al-Zewaia, and Fakher Aldeen Al-Jameel. Three hundred patients who already diagnosed with hypertension and/or type 2 Diabetes Mellitus (According to the patient medical records in these PHCs which based on Iraqi ministry of health guideline and instruction), were involved in this study. The data collection was carried out over 4 months from February to May 2018, while the whole study was conducted from 1st January to 30th June 2018.

Ethical consideration: The study protocol has been approved by the research committee of Al-Resafa Health Directorate in accordance to the code of ethics of Ministry of Health in Iraq. The objectives of the study were explained to all participants and their verbal consent were taken before collecting data that were kept confidential throughout the stages of performing the study.

Definition of the participants and exclusion criteria: in this study, we enrolled patients who had records in the selected PHC and had visited these centres during the studied period and having HT and/or T2DM for at least 6 months before the study. Pregnant ladies and those who refused to participate were excluded from the study. In our PHCs, the hypertension is diagnosed when blood pressure is above 140 and/or > 90 mmHg in two visits separated by at least two weeks.[10] While type 2 DM is diagnosed as a postprandial plasma glucose or blood capillary sugar of more than 200 mg/dl, Fasting plasma glucose of ≥ 126 mg/dl, or HbA1c measurement ≥ 6.5%.[11]

Sampling: We use the convenient sampling in enrolment of patients in this study because of limited time and resources.

Tools: The questionnaire form to extract the data was modified from the Rational Pharmaceutical Management plus Program.[11] The questionnaire form has been prepared and translated by researchers then it has been revised by eleven experts; 3 community physicians, 5 family physicians, and 3 internal physicians. The questionnaire form was tested by a pilot study on 30 patients whom have not been involved in the final analysis of the study.

Outcomes and procedures: First, we assessed the level of compliance for using drugs by three scales; Morisky compliance scale, tablet accounts, and pill identification test (PIT). Then we calculated the overall compliance. Each were grouped into three categories good compliance, medium compliance, and low compliance.

Morisky compliance scale[12] also known as self-report scale has consisted of 8 items each given one score. Eight score means good compliance, 6-7 score means medium compliance, and less than 6 score means low compliance. The percent of tablet accounts were calculated as follow:

Table accounts %= [giving tablets-remaining tablets)/ tablets must be taken] x 100%

The compliance is good when the accounts is 95 % and above, medium when it is 75-94 %, and low when it is less than 75%. Pill identification test[13] depends on the ability of the patient to know the dose of the drug, time of taking the drug, and additional instructions about it. If the patient answers these three questions correctly, it would be designated as a good drug compliant; answers correctly only the questions about the dose of the drugs and their time of administration, it would be designated as a medium compliant; and answers correctly only one question or confuses to answer anyone then the compliance is labelled as being low.

The overall compliance approach provides data from different scales. This can overcome some drawbacks in each scale for example Morisky scale (self-reporting) overestimates the compliance.[9] We tabulated the data from different scales as seen in **table 1**. If data fall in the same vertical column are harmonized in terms of level of compliance, the overall compliance would be good if all the three scale are good, medium if all of them are medium, and low if all of them are low. If data of a similar level of compliance of the three scales distributed over two columns, we take the right column as the estimated adherence. While if they spread over the three columns then we use the middle level of adherence.

After that, we try to find any association between some parameters and the degree of compliance. The parameter tested were age, gender, level of education, current marital status, visiting public and/ or private health institutions, level of health education received by the patients, degree of communication level with health care providers, and complying with the life style modification related to his diseases.

Level of health education was assessed based on the American Family Physician Guidelines.[15] It based on the ability of the patient to know some of the risk factors about his disease like quitting smoking, switching from saturated to unsaturated fat, doing regular exercise, decreasing salt intake, drinking purified water. If all the five items are done by the patient it considered good health education, if 3-4 items are done it is considered middle health education, and it would be poor if two or less items are done.

Communication between patients and healthcare providers were assessed through answering 8 questions. The first four were about patient's understanding about the disease, its seriousness, its complications and danger, ant its drugs and treatment. The second four were about patient's perception whether the health care providers have explained the disease, explained drugs and management, explained cost and benefit, and were very helpful on counselling. Health care providers have included doctors and nurses. We considered communication as being good if answer yes to 5-8 questions, while it is considered weak if the patient answer yes to 4-0 questions.

In order to assess control state for each patient, we measured the blood pressure by a mercury sphygmomanometer after asking the patient to be in complete rest for at least 30 minutes. The first reading is omitted and we took the second one 10 minutes apart. Then, a venous blood sample was withdrawn to measure the random blood sugar. Blood pressure below 140/90 mmHg and random blood sugar less than 180 mg/dl was considered a marker of control. Measurement of HbA1c was not available at the PHCCs at the time of the study.

Statistical analysis: The statistical package for social science (SPSS) version 23 was used for data entry and analysis. Data were presented in simple measures of frequencies,

Table 1 | Over all compliance

Self-reporting (Morisky)	No to all questions	Yes to 1 question	Yes to 2 or more questions
PIT- Client knows the…	Dose, time, and instructions	Dose and time	Dose only or confused
Pill count	95% or more	75–94%	Less than 75%
Overall Adherence	Good or high	Medium or Moderate	Low

Table 2 | Distribution of the patients according to their demographic features

Characteristics		Frequency (No. = 300)	%
Age (years)	< 40	21	6.9
Mean 57± 5.083 years	40-49	52	17.3
	50-59	103	34.3
	60-69	89	29.7
	70-79	31	10.3
	≥ 80	4	1.3
Gender	Male	83	27.7
	Female	217	72.3
Educational level	Illiterate	49	16.3
	Can read and write	23	7.7
	Complete primary	100	33.3
	Complete secondary	78	26.0
	Graduate college/institution	47	15.7
	Postgraduate	3	1.0
Marital status	Currently not married	68	19.3
	Currently married	242	80.7
Presence of DM or / and HT	Hypertension	48 / 224 with HT	49.3
	Diabetes Mellitus	76 / 152 with DM	25.3
	Both	76	25.3

percentage; chi-square test for independence was used to test the significance of associations between discrete variable. P value less than 0.05 were considered significant.

RESULTS

In this study, 300 patients agreed to participate, and their mean of age was 57 years ± 5.083. A third of them 103(34.3%) were in the age group 50-59 years, a majority were women 217 (72.3%), and 148 patients (49.3 %) had only hypertension, 76 (25.3 %) had only diabetes mellitus, and 76 (25.3 %) had both diseases. For other demographic features **see table 2**

Figure 1 shows that abot two thirds of patients with HT or T2DM were uncontrolled, 156 patients (69.6 %) for HT and 98 (64.5 %) for T2DM.

Table 3 shows the level of compliance in the three scales and the overall compliance. The pill identification test has shown the highest good compliance 264 (88%). On the contrary, Morisky scale has shown that 113 patients (37.7 %) had low compliance.

Table 4 shows the association of some parameters to the level of compliance as measured by Morisky scale. The only statistically significant association was with visiting health institutions other than PHCs, p value is 0.033. While it was the understanding of life style modification that found to have a statistically significant association with the level of compliance measured by tablet account (P value 0.000), **see table 5**. **Table 6** shows that assessment of patient- health care providers' communication and understanding life style modification have shown a significant statistical association with the level of compliance where it is measured by pill identification test (P value 0.000 and 0.008 respectively). For the overall compliance (**table 7**), the statistically significant association was with visiting health association other than PHCs (P value 0.004), and the assessment of patient- health care providers' communication (P value 0.031)

DISCUSSION

About two thirds of the respondents were

Table 3 | Level of compliance on different scales

Type of the scales	Level of compliance	No.	%
Self-report/ Morisky scale	Good compliance	96	32
	Medium compliance	85	28.3
	Low compliance	113	37.7
Pill Identification Test	Good compliance	264	88
	Medium compliance	20	6.7
	Low compliance	10	3.3
Tablet accounts	Good compliance	221	73.3
	Medium compliance	28	8.7
	Low compliance	45	14.7
Over all compliance	Good compliance	89	30.3
	Medium compliance	108	36.7
	Low compliance	97	33
Total		294	100

Note: Analysis was done on 294 patients because 6 were on no drugs

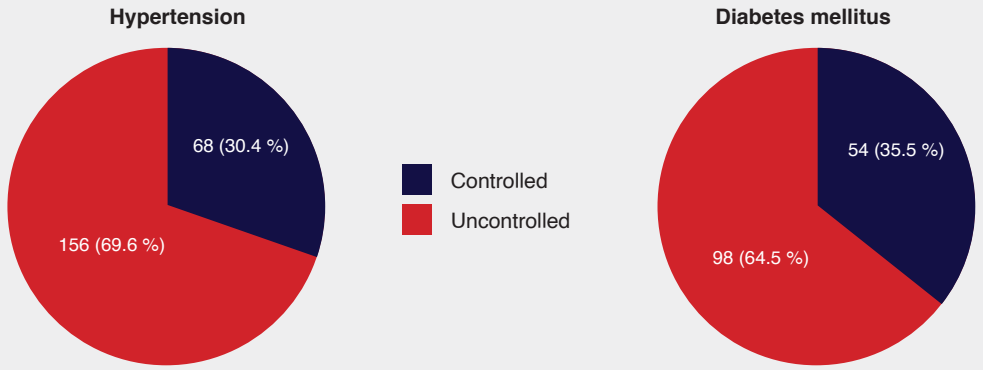

Figure 1| Control status of patient with hypertension and diabetes mellitus

Table 4 | Relationship between studied patients' Morisky compliance scale/self-report and their demographic features PHC services

Characteristics		Self-report (Morisky scale of compliance)			Total N=294	P value
		Good N = 96	Medium N = 85	Low N = 113		
Age (years)	≤ 40	5	5	11	21	0.538
	40-49	18	15	16	49	
	50-59	32	25	44	101	
	60-69	26	30	32	88	
	≥ 70	15	10	10	35	
Gender	Male	26	25	31	82	0.932
	Female	70	60	82	212	
Educational level	Illiterate	19	11	18	48	0.186
	Read and write	10	8	4	22	
	Primary certificate	25	28	45	98	
	Secondary certificate	22	26	29	77	
	College/institution certificate	19	10	17	46	
	Postgraduate certificate	1	2	0	3	
Married condition	Currently not married	17	15	25	57	0.644
	Currently married	79	70	88	237	
Visiting other than PHC	Only go to PHC	17	10	24	51	0.033
	Public health institution	10	25	20	55	
	Private health institution	64	48	63	175	
	Privet and public clinic	5	2	6	13	
Received HE	Received good HE	45	50	46	141	0.063
	Received middle HE	40	32	53	125	
	Received weak/no HE	11	3	14	28	
Assessment of patient-healthcare providers' communication	Good communication	83	80	99	262	0.206
	Weak communication	13	5	14	32	
Life modification	Well bound to life modification	83	75	86	244	0.099
	Weak bound to life modification	13	10	27	50	

Note: Analysis was done on 294 patients because 6 were on no drugs

Table 6 | Level of drug compliance of patients by Pill Identification Test and their association with some demographic features and PHC services.

Characteristics		Pill identification test (compliance)			P value
		Good N= 264	Medium N= 20	Low N=10	
Age (years)	≤ 40	18	2	1	0.568
	40-49	46	2	1	
	50-59	92	7	2	
	60-69	80	4	4	
	≥ 70	28	5	2	
Gender	Male	75	4	3	0.712
	Female	189	16	7	
Educational level	Illiterate	42	4	2	0.578
	Read and write	20	0	2	
	Primary certificate	85	10	3	
	Secondary certificate	70	4	3	
	College/institution certificate	44	2	0	
	Postgraduate certificate	3	0	0	
Married condition	Currently not married	49	5	3	0.538
	Currently married	215	15	7	
Visiting other than PHC	Only go to PHC	44	5	2	0.563
	Public health institution	47	4	4	
	Private health institution	161	10	4	
	Privet and public clinic	12	1	0	
Received HE	Received good HE	129	8	4	0.736
	Received middle HE	111	10	4	
	Received weak/no HE	24	2	2	
Assessment of patient-healthcare providers' communication	Good communication	237	20	5	0.000
	Weak communication	27	0	5	
Life style modification	Well bound to life modification	225	12	7	0.008
	Weak bound to life modification	39	8	3	

Note: Analysis was done on 294 patients because 6 were on no drugs

Table 5 | Level of drug compliance of patients by tablet account and their association with some demographic features and PHC services.

Characteristics		Tablet count (compliance)			P value
		Good N= 221	Medium N= 28	Low N=45	
Age (years)	≤ 40	15	1	5	0.137
	40-49	35	9	5	
	50-59	73	13	15	
	60-69	69	4	15	
	≥ 70	29	1	5	
Gender	Male	60	6	16	0.376
	Female	161	22	29	
Educational level	Illiterate	38	2	8	0.513
	Read and write	19	0	3	
	Primary certificate	72	9	17	
	Secondary certificate	57	9	11	
	College/institution certificate	32	8	6	
	Postgraduate certificate	3	0	0	
Married condition	Currently not married	46	4	7	0.555
	Currently married	175	24	38	
Visiting other than PHC	Only go to PHC	35	3	13	0.318
	Public health institution	42	4	9	
	Private health institution	133	20	22	
	Privet and public clinic	11	1	1	
Received HE	Received good HE	105	13	23	0.904
	Received middle HE	96	11	18	
	Received weak/no HE	20	4	4	
Assessment of patient-healthcare providers' communication	Good communication	196	28	38	0.106
	Weak communication	25	0	7	
Life modification	Well bound to life modification	195	21	28	0.000
	Weak bound to life modification	26	7	17	

Note: Analysis was done on 294 patients because 6 were on no drugs

Table 7 | Level of drug compliance of patients by over all compliance level and their association with some demographic features and PHC services.

Characteristics		Tablet count (compliance)			P value
		Good N = 89	Medium N = 108	Low N = 97	
Age (years)	≤ 40	4	6	11	0.655
	40-49	17	20	12	
	50-59	31	37	33	
	60-69	25	34	29	
	≥ 70	12	11	12	
Gender	Male	24	30	28	0.958
	Female	65	78	69	
Educational level	Illiterate	17	12	19	0.138
	Read and write	10	8	4	
	Primary certificate	24	35	39	
	Secondary certificate	19	33	25	
	College/institution certificate	18	18	10	
	Postgraduate certificate	1	2	0	
Married condition	Currently not married	15	20	22	0.579
	Currently married	74	88	75	
Visiting other than PHC	Only go to PHC	16	11	24	0.004
	Public health institution	7	27	21	
	Private health institution	61	67	47	
	Privet and public clinic	5	3	5	
Received HE	Received good HE	40	60	41	0.224
	Received middle HE	38	42	45	
	Received weak/no HE	11	6	11	
Assessment of patient- healthcare providers' communication	Good communication	76	103	83	0.031
	Weak communication	13	5	14	
Life modification	Well bound to life modification	78	92	74	0.089
	Weak bound to life modification	26	7	17	

Note: Analysis was done on 294 patients because 6 were on no drugs

aged (50-69) years old; this is expected because the prevalence of hypertension and type 2 diabetes mellitus increases with age. The third NHANES survey reported that the prevalence of hypertension grows significantly with increase age in all gender and race groups.[11,16,17]

In our data, 217 participants (72.3 %) were women. This is the norm in Iraq as women usually visit PHCs for herself or to bring their children, while men usually work in the morning.[18] Also, this is consistent with non-communicable diseases (NCD) survey in which women tend to seek for advice more than men.[19,20] In Ghazza, Palestine; women represent 60.8 % of those who registered as having chronic diseases.[21]

About one third of the participants had completed their primary education and more than three quarters were married at the time of the study. This is consistent with the results of the NCD risk factors STEPS survey in Iraq 2015[19] that estimated the largest percentage of the respondents (25.5%) had completed the primary education and 75% of the respondents were married at time of the survey.

More than 80 % of the participants are visiting health institutes other than PHCs, the majority of those are visiting the private clinics. The reasons behind this attitude may be explained by the lack of some laboratory tests like HbA1c, inconsistent availability of the drugs, low confidence with the quality of services or its prices that are provided by the PHCs, or patients' preference to go directly to the hospitals.

Effective communication between the physician and the patient depends partly on physician's confidence in his/her ability to treat and educate the patients and to the availability of enough time during the daily practice. The vast majority of the participants have thought that they received a good counselling, and high percentage had modified their lifestyle according to doctor's instructions. This is similar to a study conducted in USA in which 84.3% of the adult population reported receiving lifestyle modification counselling.[22] As receiving health education about life style modification is important and its one component of management of chronic disease especially T2DM and HT.[23]

On assessing the compliance by many scales, we found that good compliance was found in 264 patients (88 %) in pill identification test, and in 221 patients (73.3 %) and 96 patients (32 %) in tablet accounts and Morisky scales respectively. The overall compliance was found in about 30 % of our sample.

The Morisky scale is the closest ratio of good compliance to the overall compliance. The low rate of good compliance in Morisky scale is in contrary to what is known as Morisky scale may overestimate the compliance because the patient might hide some facts regarding use of drugs regularly.[9]

In our study we found that about a third of participants was a good adherent to their medication as measured by Morisky scale, and this is much less than what a Lebanese study[24] has shown in patients with hypertension where 50 % of them are highly adherent to their medication according to Morisky scale.

The overall patient's compliance less than one third of the participants showed full adherence. This percentage is a bit higher than the result of a study in Iraq where less than a quarter of surveyed patients with hypertension reported to be full adherent to their medications.[2, 25] Our good adherence rate was also better that than that reported from Ethiopia[26] and Bangladesh,[27] but consistent to the WHO publication in 2003 that estimated the average adherence to long term therapy for chronic illnesses is 50% in developed countries and even lower in developing countries.[28] many other studies have shown variable ratios of good adherence ranging from 40 to 75 %.[29,30] The different results among different studies might be due to the different targets of the studies, using different scales to measure the adherence to the drugs, and different sociocultural factors.

About two thirds of our participant had uncontrolled blood pressure; this could be due to stress accompanying visiting a health institution or presence of white coat hypertension. A study in USA which had an approximate result and their participants have adhered to life style modification and treatment though had a higher mean systolic blood pressure has explained this unexpected association by the fact that patient with poorly controlled blood pressure are more motivated to adhere to recommendations.[22] Similar to patients with hypertension, two thirds of patients with type 2 DM were uncontrolled. As mortality is significantly increased in patients with poorly controlled HT and T2DM[31] more care and planning to be done to achieve better control.

About two thirds of the participants considered themselves completely committed to doctor's instructions; this is similar to a study conducted in USA in which 88% of them reported adherence to those recommendations.[22] A study in Italy found that 39.3% patients reported themselves as being adherent to medications over the 4 weeks preceding their medical specialist's visit.[32]

Many studies have suggested that the nonadherence frequently occurs for a variety of patient-related factors, including socio-demographic and socio-economic characteristics, personal schedules, lack of understanding the diagnosis and treatment, concerns about effectiveness and side effects of treatment, and the desire to manage the situation independent of the medical profession. Possible barriers to adherence include characteristics of the medicines and their dosage and schedules, practical issues related to access to medications, its costs, and physician-patient relationship.[32]

In our study, we found a statistically significant association between level of compliance measured by Morisky scale and visit to health institutions other than PHCs. This relationship has been found in a study from Botswana.[33]

Pill accounts can be routinely used in clinical practice as it is highly accurate, has a low cost, simple, and can be used for various

drugs formulation.[34] We found that drug adherence by this method has a significant statistical association with application of patient life modification.

This study has found that the overall good compliance has a statistically significant association with participants' visiting of health institutions other than PHCs, p value is 0.004. This kind of association might indicate that the drive for good compliance comes from health care providers working in other health institutions than from those working in PHCs and this attitude if it true needs to well-studied and overcome by a comprehensive plan. Many reasons could stand behind this. First, care provided for patients with chronic and non-communicable diseases in the PHCs fall short of the growing needs of patients in recent years and the USAID (PHCPI) in 2011 demonstrated weaknesses in the capacity of the PHC to provide these services.[35] Second, is the lack of drugs, supplies and equipment in the local PHC with frequent out of stock of the essential drugs and lab supplies. Although the first line treatment of hypertension and diabetes have been added to the list of essential drugs for PHC, but public clinic act as a source for essential drugs. In addition, adherence to drugs is higher among patients who see the same healthcare provider each time they have a medical appointment. In this group, the average adherence is 81 % as have been stated by "Medication Adherence in America".[36] lastly, in Iraq as in most Middle Eastern countries care of NCD is typically provided by specialists who have little involvement with PHCs with a great tendency of the patients to be seen by specialists in secondary and tertiary centres.

This study has also found that the overall good compliance has a statistically significant association with level of communication between the patients and the health care providers, p value is 0.031. The effect of good communication on compliance to drugs is well established.[37] However, a study from Al-Madina Al-Monawara in Saudi Arabia has found that a satisfactory communication is reported only in 14.4 % of good drug complaint.[38]

Limitation of the study: Several limitations of this study deserve to be mentioned. Firstly: limited time prevent us from including more PHCCs and more patients from the enrolled centres. Secondly: due to unavailability of data, we were unable to include more parameters and to test their link to drug compliance, such as co-morbid chronic diseases, state of control of diseases, and patient's income. Thirdly: unavailability of some laboratory tests like HbA1c at the PHCs prevent us from including this important test in our assessment in the diagnosis and control status of diabetes mellitus.

CONCLUSION

The scales used to detect good drug compliance in patients with Hypertension and/or diabetes mellitus who are visiting PHCs in Iraq are inconsistent. Pill identification test shows the highest rate of good drugs complaints while Morisky scale is the lowest. In general compliance is still poor and by overall compliance scale about two thirds of patients were incompliant. The level of complaint by overall scale is significantly associated with the patient's attitude to visit health institutions other than PHCs and the effectiveness of patient-health care providers' communication.

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Abbreviations list: Haemoglobin A1c (**HbA1c**), Hypertension (**HT**), Milligram per decilitre (**mg/dl**), Millimetre of mercury (**mmHg**), Non-communicable diseases (**NCD**), Pill identification test (**PIT**), Primary Healthcare Centres (**PHCs**), Statistical package for social sciences (**SPSS**), Type 2 diabetes mellitus (**T2DM**), United states of America (**USA**), World Health Organization (**WHO**).

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