

RESEARCH ARTICLE

HYPERTENSION AND TYPE 2 DIABETES MELLITUS PATIENT'S COMPLIANCE FOR TREATMENT-DRUGS: SAMPLE FROM RESAFA SECTOR PHCS BAGHDAD, 2018

*Sahar A. E. Al Shatari, Sally A. Witwit, Khelowd Salih, Yahiya B. H. Al- Juboori, Ahmed Sabbar Gabur, Alaa Safaa Abed and Shams Wisam Talib Al Tabtabaee

PHC of Al-Resafa sector/ Al-Resafa health directorate, / Baghdad/ ministry of health, Iraq

Accepted 27th November 2018; Published Online 25th December 2018

ABSTRACT

Background: Hypertension and Type 2 Diabetes Mellitus prevalence's are increased in Iraq. Patient compliance to treatment is a factor in the outcome of medical treatment. **Objectives:** Assess Resafa sector PHCs Hypertension and type 2 Diabetes Mellitus patients' compliance for treatment- drug and its factors. **Methodology:** cross sectional study with analytic element, was conducted by involved of hypertension and type 2 Diabetes Mellitus patients in al-Resafa sector PHCs. Three hundred patients were involved in this study by using 3 different scales Morisky compliance scale/ self report, Pill identification test, and tablet account to assess their compliance. Blood pressure and blood sugar, height and weight measured for each. **Results:** out of 300 patients, 148 patient with HT, 76 patient with NIDM, 76 patients have both, most of participants 103(34.3%) aged 50-59 yrs, 217(72.3%) female, 100(33.3%) primary educational level, 242(80.7%) currently married, diagnosed since 1-6 years of the study, 143(47.7%) receive good counseling, 249(83%) modified their lifestyle, Morisky scale show 113(38.43%) low compliance, while tablet accounts 221(75.17%), pills identification 264(89.79%) show good compliance, and 108(36.73%) overall compliance was medium, 66% patients had uncontrolled blood pressure, 64% uncontrolled blood sugar, 50% obese, and 26% lost weight. **Conclusion:** Near one third of the respondents had good overall compliance & two thirds of them had uncontrolled hypertension as well as NIDM, and half of them obese.

Key words: Hypertension, diabetes mellitus, Morisky scale, compliance, Resafa sector, Baghdad, life style modification, health education.

INTRODUCTION

Non-communicable diseases are chronic in nature and may not cure; however, existing evidence indicates that these diseases are largely preventable by means of effective intervention that tackles their shared contributory risk factors and the underlying social determinants. In addition, early detection and proper management of such diseases can reduce morbidity and premature death and may improve the quality of life (The National Strategy for Prevention and Control of Non-communicable Diseases, 2017). Hypertension (HT) is known as "raised blood pressure (BP) or silent killer" which is responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke, it needs more attention to help patients having better life and outcome. And it's 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. HT affect 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 (Safaa Hashim, 2015). Type 2 Diabetes Mellitus is a common chronic metabolic disorder (Hanady, 2014). It is estimated that the global prevalence will increase from 6.9 % in 2010 to 7.7 % in 2030 (Werner *et al.*, 2015). The goals in caring for patients with type 2 Diabetes Mellitus are to eliminate symptoms and to prevent, or at least slow, the development of complications. Microvascular (i.e. eye and kidney disease) risk reduction is accomplished through control of blood sugar and blood

pressure; Macrovascular (i.e. coronary, cerebrovascular, peripheral vascular) risk reduction, through control of lipids and hypertension, smoking cessation, and aspirin therapy; and metabolic and neurologic risk reduction, through control of blood sugar (Romes Khardori, 2018). Both Hypertension and Type 2 Diabetes Mellitus are chronic disorders with a large number of people living with chronic diseases that can adversely affect their quality of life (QoL). The World Health Organization (WHO) defines health as not merely the absence of disease or infirmity, but a state of complete physical, mental and social well being (Constitution of WHO). The definition of Quality of Life (QoL) is more complex. According to WHO, QoL is defined as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (Megari, 2013). The Iraq national strategy for prevention and control of non-communicable diseases goal is to reduce morbidity and premature mortality attributed to chronic non-communicable diseases (The National Strategy for Prevention and Control of Non-communicable Diseases). Glycemic control largely depends on compliance with medication therapies. In fact, the most common problem in patients with diabetes is non-compliance with medications (Shamsi *et al.*, 2014; Aatur *et al.*, 2012). Poor diabetes control is a substantial public health problem, and annual costs of diabetes now approach \$245 billion. Treatment to improve blood glucose can prevent diabetes complications and reduce costs. Despite the evidence supporting glycemic control, fewer than 60% of diabetes patients achieve recommended blood glucose goals (hemoglobinA1c (HbA1c) <7.0%) (Crowley *et al.*, 2013). The participants at the WHO Adherence meeting in June 2001(1) concluded that defining adherence as "the extent to which the

*Corresponding author: Sahar A. E. Al Shatari,

PHC of Al-Resafa sector/ Al-Resafa health directorate, / Baghdad/ ministry of health, Iraq.

patient follows medical instructions” was a helpful starting point. However, the term “medical” was felt to be insufficient in describing the range of interventions used to treat chronic diseases. Furthermore, the term “instructions” implies that the patient is a passive, acquiescent recipient of expert advice as opposed to an active collaborator in the treatment process (Sabate, 2011). Because most of the care needed for chronic conditions is based on patient self-management (usually requiring complex multi-therapies, the use of medical technology for monitoring and changes in the patient’s lifestyle, patients face several potentially life-threatening risks if health recommendations are not followed as they were prescribed (Sabate, 2011; Sabate, 2003). In-adequate medication adherence limits effective treatment for many diseases. Non-adherence is a pervasive under-recognized cause of poor health outcomes. Taking into account unfilled prescriptions, missed doses, and inadequate persistence, patient medication adherence averages only 50 % (Conn *et al.*, 2016). A Cochrane review included almost 200 randomized controlled trials (RCTs), and it was evident that in only a minority of the lowest risk of bias, RCTs improved both adherence and clinical outcomes (Nieuwlaat *et al.*, 2014).

Objective

- a- Assess Resafa sector PHCs Hypertension and type 2 Diabetes Mellitus patients' compliance for treatment-drug and its factors.

MATERIALS AND METHODS

Cross sectional study with analytic element, was conducted by hypertension and type 2 Diabetes Mellitus patient in sixth of al-Resafa sector PHCs. Three hundred patients were involved in this study; were interviewed by a tested questionnaire modified from Rational Pharmaceutical Management plus Program (Davidson’s Principles and Practice of medicine) by the researchers and opinion of three community physicians, five family physicians, and three internal physicians taken in consideration. And pilot with 30 patient which not involved in the study. Socio-demographic (age, gender, educational level, marital status), present of hypertension and type 2 Diabetes Mellitus or both, since when its diagnosed, PHC visiting details, visiting health institution other than the PHC, services details in the PHC also 5Q on health education one on his/her opinion about his/her compliance and 8Q on doctors and nurse communication skill (reliability =0.793) and 8 on lifestyle modification if done or not (reliability =0.705), and by using 3 different scales (Morisky compliance scale/ self report, Pill identification test PIT, tablet accounts) and average compliance for each (reliability =0.849). Blood pressure and fasting/random blood sugar (as possible), height and weight measured to find the body mass index. The data collection was carried out over a period of 4 months (Feb-2018 to may-2018) after an ethical and scientific approval was granted from the al Resafa /Baghdad directorate; and whole study done 1st January – 30th June.

Coding

Health education: according the American family physician association guideline (stop smoking, decrease saturated fat and switch to unsaturated fats, regular exercises, decrease salt intake, purified water intake), considers good if all 5 items is

done, middle if 4-3 items, poor if 2-0 items done (Davidson’s Principles and Practice of medicine).

Communication skill: (Understand my disease, understand disease seriousness, understanding drugs & treatment, understanding complication and dangers, dr. explain my disease, dr. explain drugs and management, dr. explain cost and benefit, dr. communication is very good help me to follow him all the counseling): considers good if the patient answer yes for 8-5 items is done, weak if 4-0 items,.

Self report {Morisky 8-Item Medication Adherence Scale (MMAS)} results classified into three categories: good compliance (score 8), Medium compliance (score 6-7) and low compliance (score less than 6) (Morisky *et al.*, 2008).

Tablet accounts:

$$\text{Tablet accounts \%} = \frac{\text{Giving tablets - remaining tablets}}{\text{Tablets must be taken}} \times 100\%$$

Considers good if the Tablet accounts Compliance level was 95% or more, medium compliance if 94-75%, and consider low if Less than 75%.

Pill identification test (Steel *et al.*, 2007): We ask about name, how many tablet, when you must take the drug, if he/she answer Dose, time, and instructions correctly is consider as good compliance, if 2 of three (Dose and time) answered correctly consider as medium compliance, if 1 of three (Dose only or confused) answered correctly as low compliance.

Over all compliance (Steel *et al.*, 2007): This multi-method approach provides data from different sources that can be compared to assess client adherence (triangulation) to verify the true level of adherence (Steel *et al.*, 2007). At the very minimum it should record the results of the self report. However, this has a tendency to measure higher levels of compliance than actually happened.

- a) When the results do not all line up in a single vertical column:
 - If all the results appear in the same column, then the overall level of adherence is “High.”
 - If they are spread over two columns; take the adherence level of the right hand column as the estimated adherence.
 - If they are spread over three columns, then use the middle level of adherence.

Blood pressure level (Nieuwlaat *et al.*, 2014):

- a. Normal blood pressure < 140 and < 90
- b. Stage I hypertension > 140 and/or > 90
- c. Stage 2 hypertension > 160 and/or > 100
- d. Stage 3 hypertension > 180 and/or > 110.

Type 2 Diabetes Mellitus (Nieuwlaat *et al.*, 2014; Katrina Donahue *et al.*, 2012): Random plasma glucose or capillary blood sugar > 200 mg / dL).

- a. Fasting plasma glucose > 125 mg/dL on 2 occasions.
- b. 2-hour post prandial blood glucose > 200 mg/dL.

Medication	Knows the medication is taken the name(Y/N)	Time the medication is taken	the pills per dose (Y/N)	Knows the number of pills per dose (Y/N)	Time the medication is taken			Knows any additional instruction
					Morning (hour)	Evening (hour)	Judged correct (Y/N)	
Self-reporting		No to all questions		Yes to 1 question		Yes to 2 or more questions		
PIT- Client knows the... Pill count		Dose, time, and instructions 95% or more		Dose and time 75–94%		Dose only or confused Less than 75%		
Overall Adherence		Good or high		Medium or Moderate		Low		

Body mass index:

BMI =Weight (kg)/ (height in meters)

1. Below 18.5 =underweight
2. 18.5 to 24.9 = normal or healthy weight
3. 25.0 to 29.9 = overweight
4. 30 to 39.9 = obese
5. 40 and above = morbid obesity

Data entry and statistical analysis done by using SPSS ver.23, frequencies and percentage, chi square and P value calculated and consider significant if less than 0.05. Included criteria all non pregnant HT &/ or NIDM patient visiting the PHC during the data collection period whom diagnosed before 6 month and more.

RESULTS

In this study, 300 respondents agreed to participate in this study third of them 103(34.3%) aged 50-59 years followed by 89(29.7%) 60-69 years old& 33.3% completed their primary education. The majority of the respondents were females (72.3%) and about 80.7% of the respondents were currently married as shown in Table (1).

Table 1. Distribution of the patients according to their demographic features

		Frequency	%
Age (years)	Less than 40	21	6.9
	40-49	52	17.3
	50-59	103	34.3
	60-69	89	29.7
	70-79	31	10.3
	80and above	4	1.3
Gender	male	83	27.7
	female	217	72.3
Educational level	not read not write	49	16.3
	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
Total		300	100.0

In Table (2) Only 24% of the respondents had other chronic diseases; heart diseases (33.34%), joint diseases (25%) and thyroid problems (11.4%) were the commonest. The majority of the hypertensive patients (126) and diabetics (94) were diagnosed since 1-6 years of the study as seen in Figures 1, 2 below. Majority of the participants (81.67%) were visiting health institutions other than PHC; the majority of them (71.84%) were visiting private health institution (Table 3).

Table no 3: Distribution of the studied patients according to the visiting health institutions other than PHC. Although only 143 of the studied patients (47.7%) thought they receive good health education; most of the respondents (88%) considered the PHC physician had good communication skills, and 249 respondents (83%) had modified their lifestyle according to doctor's instructions as shown in Table (4) and Figure (4).

Table 2. Distribution of the patients according to present of other chronic diseases and its types

		Frequency
Other chronic disease	Not present	228
	present	72
Total		300
Chronic diseases names N= 72	hearts disease	24
	joint diseases	18
	thyroid problems	8
	IBS	7
	allergy & asthma	3
	gout	3
	others	9
	Total	

(Prostate, kidney, uterine, breast) cancers, epilepsy, hemorrhoid, hyperlipidmia

Table 3. Distribution of the studied patients according to the visiting health institutions other than PHC

		Frequency	Percent
Visiting other than PHC	Not visiting other than PHC	55	18.33
	visiting other than PHC	245	81.67
	Total	300	100.0
The others than PHC	public health institution	56	22.86
	private health institution	176	71.84
	both privet and public clinic	13	5.30
	Total	245	100

Table 4. Distribution of the patients according to PHC receiving health education level & counseling assessment

		Frequency	%
Receiving health education level	Received good health education	143	47.7
	Received middle health education	128	42.7
	Received poor health education	29	9.7
Counseling assessment	Good Communication skill	264	88.0
	Weak communication skill	36	12.0
Total		300	100.0

Although Morisky scale show large proportion of the studied patients with low compliance (113), tablet accounts and pills identification showed good compliance for the majority of the respondents (221) and (264) respectively. Collectively the overall patient's compliance was medium and only 89 of the participants (29.7%) showed full adherence as shown in Fig 5 below. Only 33% of the studied patients had normal blood pressure, and about 36% of them had well controlled NIDM (Fig 6 a and b). According to their opinions about two thirds of the respondents (69%) considered themselves completely

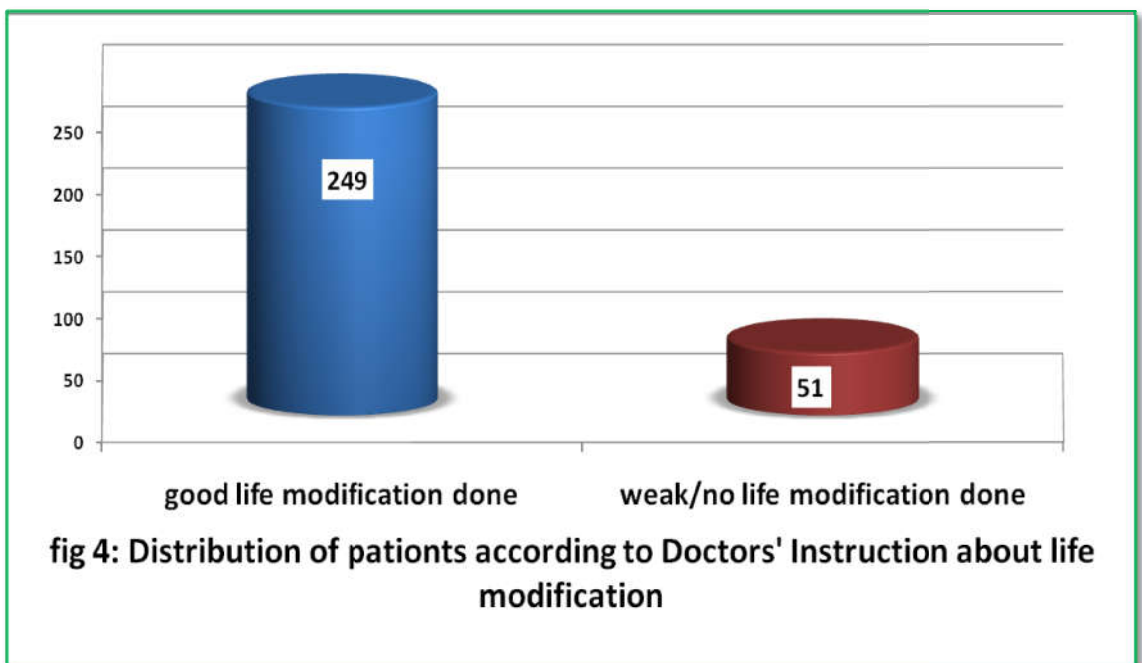
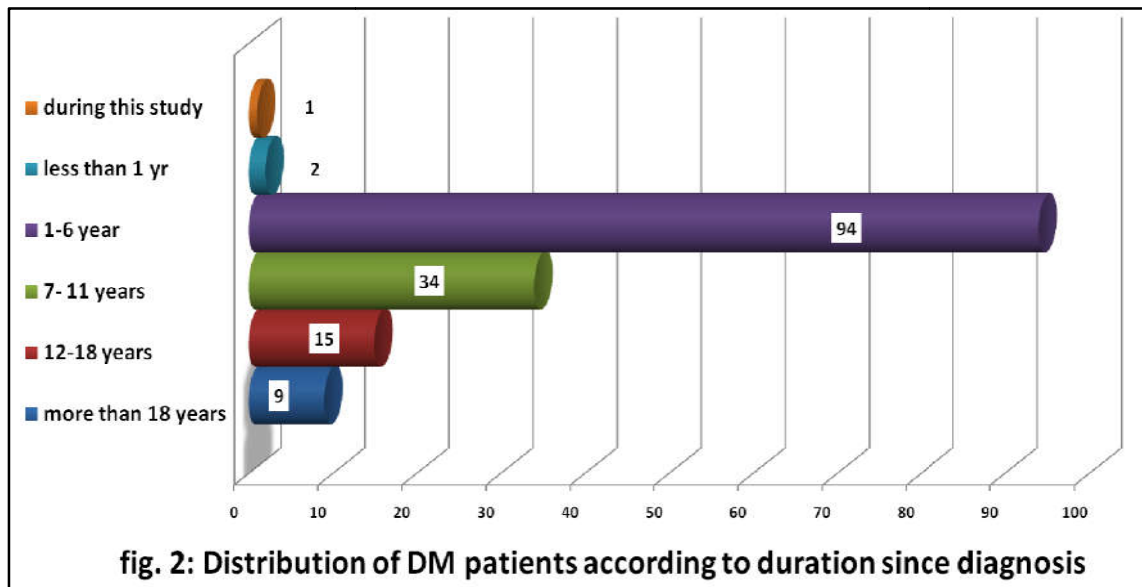
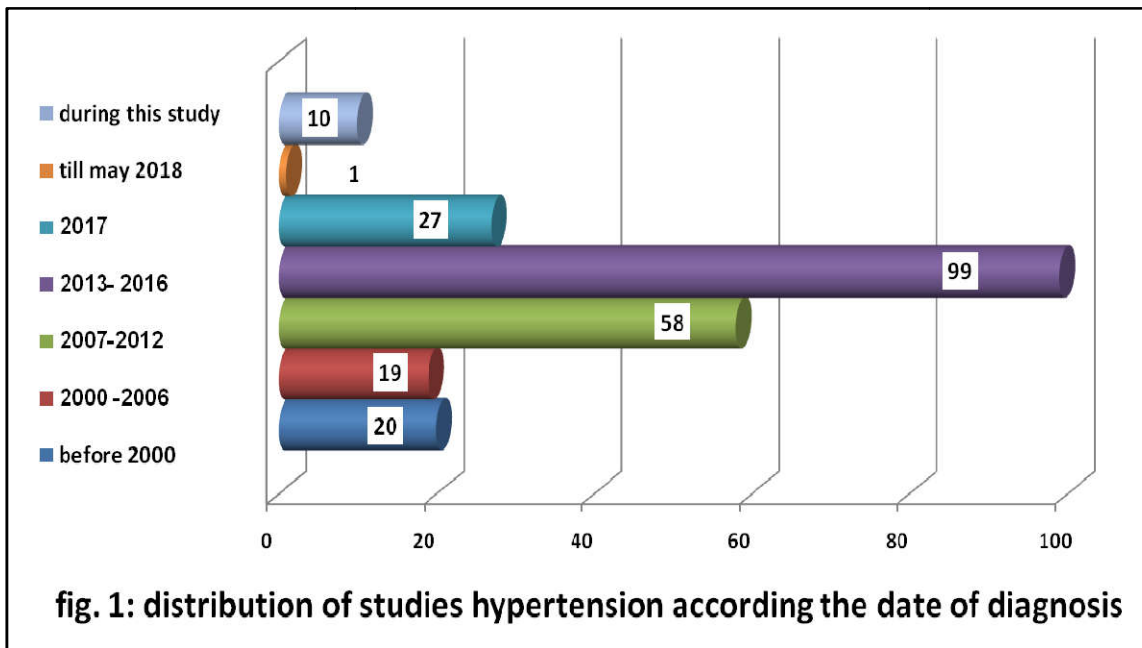


Fig 5: Distribution of the patients according to self report, Pill Identification Test, tablet accounts and average patient compliance

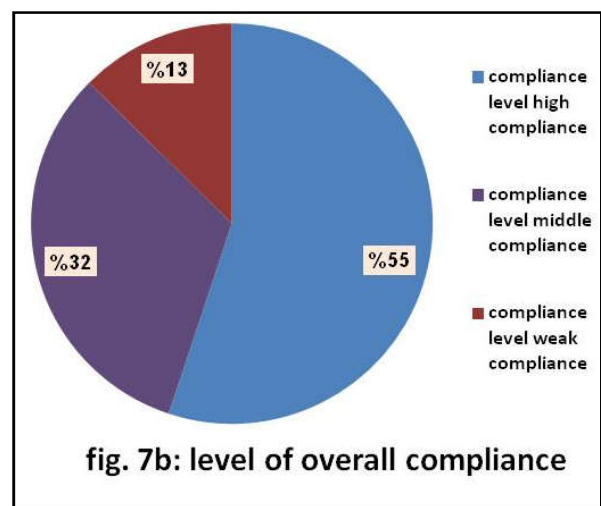
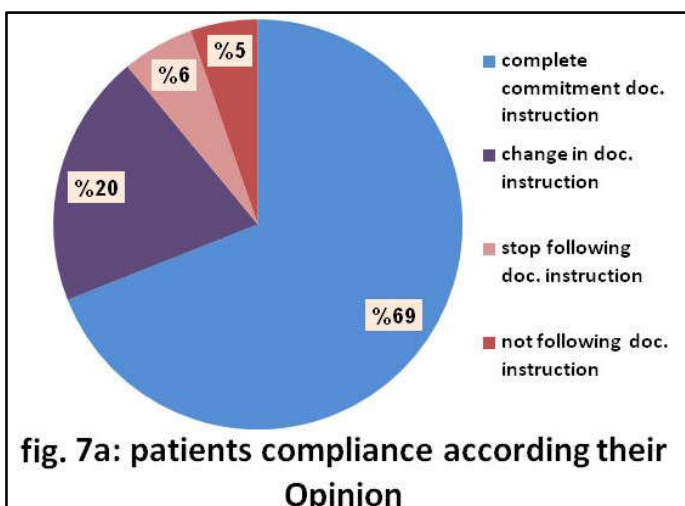
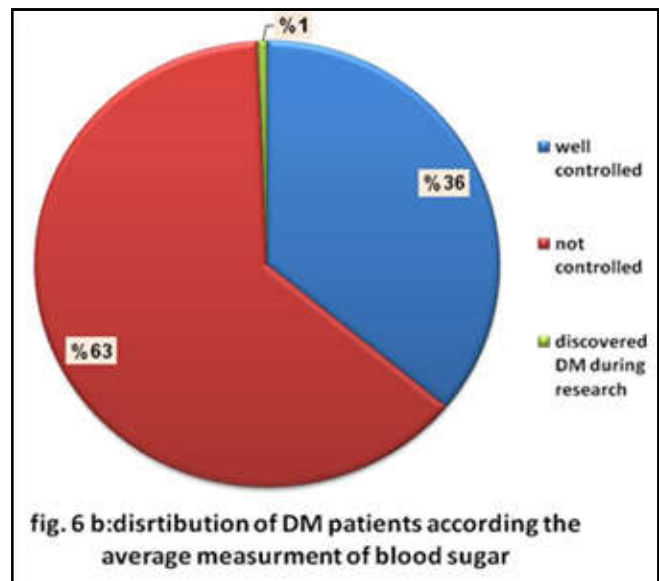
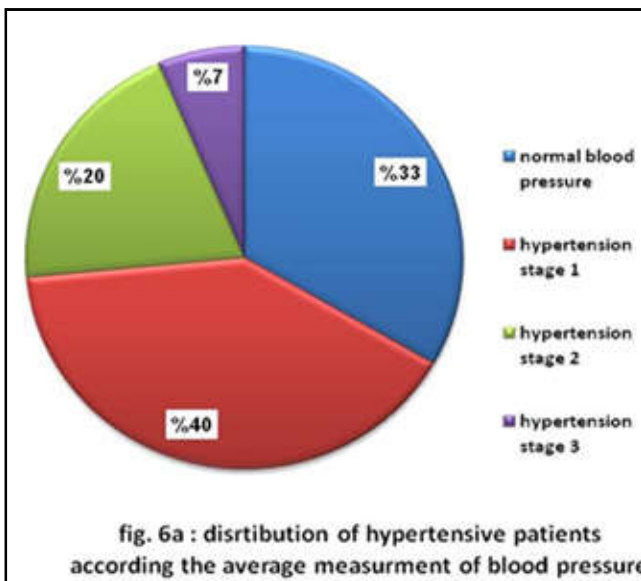
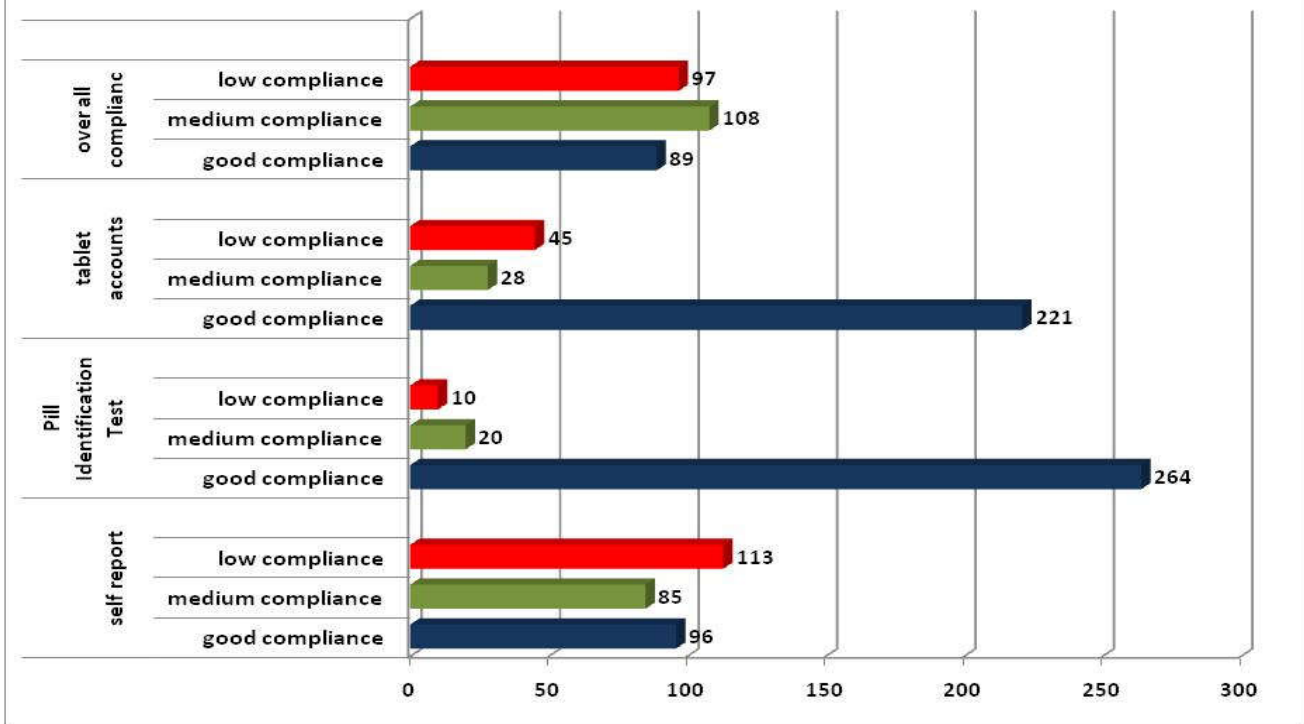


Table 5. Relationship between studied patients' Morisky compliance scale/self report and their demographic features, PHC services

		Self report (compliance)			Total N=294	P value
		Good N=96	Medium N=85	Low N=113		
Age (yr.)	≤ 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	Not read not write	19	11	18	48	0.186
	Read and write	10	8	4	22	
	Complete primary	25	28	45	98	
	Complete secondary	22	26	29	77	
	Graduate college/institution	19	10	17	46	
	Postgraduate	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	
receiving HE	Privet & public clinic	5	2	6	13	0.063
	Received good he	45	50	46	141	
	Received middle he	40	32	53	125	
counseling assessment	Received weak/no he	11	3	14	28	0.206
	Good communication	83	80	99	262	
	Weak communication	13	5	14	32	
life modification	Well life modification	83	75	86	244	0.099
	Weak life modification	13	10	27	50	

Note: the total is 294 because 6 patients with no drug

Table 6. Relationship between studied patients' tablet account and their demographic features, PHC services

		Tablet count (compliance)			P value
		Good N= 221	Medium N= 28	Low N=45	
Age (yrs)	less than 40	15	1	5	0.137
	40-49	35	9	5	
	50-59	73	13	15	
	60-69	69	4	15	
	70 and above	29	1	5	
Gender	Male	60	6	16	0.376
	Female	161	22	29	
Educational level	Not read not write	38	2	8	0.513
	Read and write	19	0	3	
	Complete primary	72	9	17	
	Complete secondary	57	9	11	
	Graduate college/institution	32	8	6	
	Postgraduate	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	
	Both privet and public clinic	11	1	1	
Receiving health education	Received good he	105	13	23	0.904
	Received middle he	96	11	18	
	Received no he	20	4	4	
Counseling assessment	Good communication skill	196	28	38	0.106
	Weak communication skill	25	0	7	
Life modification	Well life modify done	195	21	28	0.000
	Weak/no life modify done	26	7	17	

Note: the total is 294 because 6 patients with no drug

committed to doctor's instruction (Fig 7a) while the overall calculated compliance reach only 55% as shown in (Fig 7b) and the remaining 14% goes with middle compliance in spite they consider themselves as complete commitment to doctors instruction. According to the Morisky scale of compliance, there is statistically significant association between studied patients visits to other than PHC and Morisky scale of compliance (P value 0.033) (Table 5).

The relationship was statistically significant between tablet-count and patients life modification, but not with age, gender, educational level, married condition, visiting other than PHC, receiving health education, counseling assessment, as shown in Table (6). Table (7) below had showed the statistically significant relationships between Patient's compliance by pills identification and good communication skills (P value 0.000) and life style modification (P value 0.008).

Table 7. Relationship between studied patients' Pill Identification Test and their demographic features, PHC services

		Pill identification test (compliance)			
		Good N= 264	Medium N= 20	Low N=10	
Age (yrs)	less than 40	18	2	1	0.568
	40-49	46	2	1	
	50-59	92	7	2	
	60-69	80	4	4	
	70 and above	28	5	2	
Gender	Male	75	4	3	0.712
	Female	189	16	7	
Educational level	Not read not write	42	4	2	0.578
	Read and write	20	0	2	
	Complete primary	85	10	3	
	Complete secondary	70	4	3	
	Graduate college/institution	44	2	0	
	Postgraduate	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	
	Both privet and public clinic	12	1	0	
Receiving health education	Received good he	129	8	4	0.736
	Received middle he	111	10	4	
	Received no he	24	2	2	
Counseling assessment	Good communication skill	237	20	5	0.000
	Weak communication skill	27	0	5	
Life modification	Well life modification done	225	12	7	0.008
	Weak or no life modification done	39	8	3	

Note: the total is 294 because 6 patients with no drug

Table 8. Relationship between studied patients' all over compliance level and their demographic features, PHC services

		All over compliance			
		Good N= 89	Medium N= 108	Low N=97	
Age (yrs)	less than 40	4	6	11	0.655
	40-49	17	20	12	
	50-59	31	37	33	
	60-69	25	34	29	
	70 and above	12	11	12	
Gender	Male	24	30	28	0.958
	Female	65	78	69	
Educational level	Not read not write	17	12	19	0.138
	Read and write	10	8	4	
	Complete primary	24	35	39	
	Complete secondary	19	33	25	
	Graduate college/institution	18	18	10	
	Postgraduate	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	
	Both privet and public clinic	5	3	5	
Receiving health education	Received good he	40	60	41	0.224
	Received middle he	38	42	45	
	Received no he	11	6	11	
Counseling assessment	Good communication skill	76	103	83	0.031
	Weak communication skill	13	5	14	
Life modification	Well life modification done	78	92	74	0.089
	Weak /no life modification done	11	16	23	

Note: the total is 294 because 6 patients with no drug

Generally the average compliance level is significantly associated with studied patients visiting other than PHC (P value 0.004). Also there is direct significant relationship between the overall compliance and good communication skills (P value 0.031) (Table 8). The study found that controlled blood pressure is positively related to patients visiting other than PHC with p value 0.003 as shown in Table (9). Table (10) Found no demographic feature had any statistical significant relation to NIDM control (Age, gender,

educational level, married condition, visiting other than PHC, receiving health education, counseling assessment and life modification). In (Fig 8a) the largest proportion of the studied patients were overweight (40%) &only(11%) had healthy weight and the majority of them(54%) had not losing weight since diagnosis (Fig 8 b). Last not least, 120(40%) of patients involved in this study asked to supply drug for a whole one month, not as now only for 10 days and once diagnosed as the IMOH instruction.

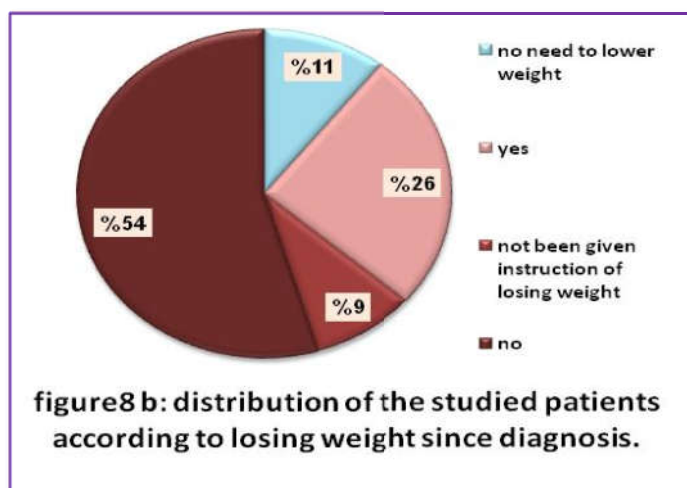
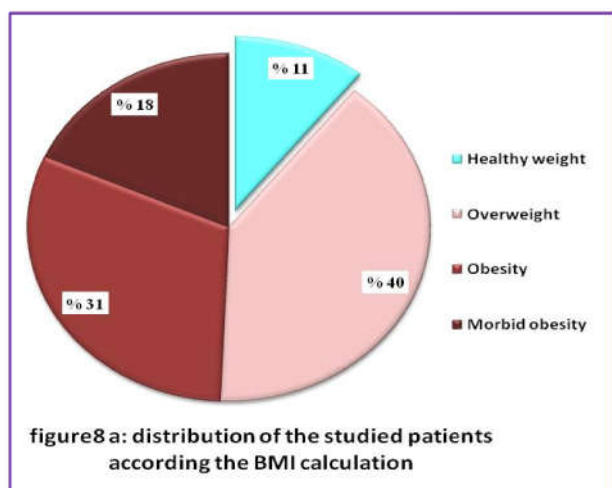
Table 9. Relationship between studied patients' Average hypertension measurement and their age, gender, educational level, marital status, income month and presents of chronic disease

		Average blood pressure				P value
		Control HT (N=78)	Stage 1 HT (N=94)	Stage 2 HT (N=47)	Stage 3 HT (N=15)	
Age (yrs)	less than 40	6	6	0	1	0.272
	40-49	19	10	6	2	
	50-59	26	35	14	6	
	60-69	21	29	20	5	
	70 and above	6	14	7	1	
Gender	Male	16	27	12	7	0.184
	Female	62	67	35	8	
Educational level	Not read not write	11	11	13	5	0.141
	Read and write	6	10	2	0	
	Complete primary	20	36	16	4	
	Complete secondary	20	26	11	4	
	Graduate college/institution	19	10	5	2	
Married condition	Postgraduate	2	1	0	0	0.813
	Currently not married	17	16	9	2	
	Currently married	61	78	38	13	
Visiting other than phc	Only go to phc	11	17	8	4	0.003
	Public health institution	6	19	13	6	
	Private health institution	54	55	25	54	
	Both privet and public clinic	7	3	1	7	
Receiving health education	Received good he	31	44	22	8	0.488
	Received middle he	37	44	20	4	
	Received no he	10	6	5	3	
Counseling assessment	Good communication skill	67	81	40	14	0.873
	Weak communication skill	11	13	7	1	
Life modification	Well life modification done	64	79	40	9	0.138
	Weak / no life modification done	14	15	7	6	

Because some patient goes only to PHC, the total is less 11, 17, &8 respectively (i.e. 67, 77, and 39 respectively).

Table 10. Relationship between patients' NIDM control and their demographic features, PHC services

		NIDM controlling		Total	P value
		Control NIDM (N=55)	Not control NIDM (N=96)		
Age (yrs)	less than 40	2	9	11	0.566
	40-49	10	15	25	
	50-59	23	33	56	
	60-69	13	29	42	
	70 and above	7	10	17	
Gender	Male	14	30	44	0.450
	Female	41	66	107	
Educational level	Not read not write	7	17	24	0.402
	Read and write	3	12	15	
	Complete primary	22	30	52	
	Complete secondary	14	21	35	
	Graduate college/institution	8	16	24	
Married condition	Postgraduate	1	0	1	0.334
	Currently not married	10	24	34	
	Currently married	45	72	117	
Visiting other than phc	Only go to phc	10	17	27	0.651
	Public health institution	9	24	33	
	Private health institution	31	49	80	
	Both privet & public clinic	4	5	9	
Receiving health education	Received good he	22	48	70	0.442
	Received middle he	25	44	69	
	Received no he	8	4	12	
Counseling assessment	Good communication skill	45	88	133	0.072
	Weak communication skill	10	8	18	
Life modification	Well life modify done	51	79	130	0.074
	Weak /no life modify done	4	17	21	



DISCUSSION

After applying the inclusion and exclusion criteria, about two thirds of the respondents were aged (50-69) years old; this is expected because of the hypertension and type 2 Diabetes Mellitus prevalence increase with age. The third NHANES survey reported that the prevalence of hypertension grows significantly with increase age in all sex and race groups (Katrina Donahue *et al.*, 2012; Guideline for Type 2 Diabetes Mellitus and Metabolic Syndrome Management; Albert, 2014). Most of them were female; this is because normally in Iraq most of the PHCs clients are females either as patients or with their children, while most of males are working in the morning time of PHC (Thompson, 2012). Also this is consistent with NCD survey in which females seemed to seek advice more than males (Sanaullah Panezai *et al.*, 2017; STEP wise approach to chronic disease risk factor surveillance). In Ghazza, Palestine; the percentage of females from total chronic diseases registered 60.8% (Raynald Pineault *et al.*, 2017). About one third had completed their primary education and more than three quarters were married at the time of the study. This is consistent with NCD risk factors STEPS survey in Iraq 2015⁽²³⁾ 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 survey. According to the respondents had other chronic diseases; heart diseases, which is consider complication of both NIDM and HT was the commonest followed by joints disease. NIDM increased risk of various bone and joint disorders. And being overweight increase the risk of developing both NIDM type 2 and OA (PHIC- MOH, 2015; Arlan, 1996; Mayo Clinic staff, 2018; Additional types of neuropathy, 2018; Leslie *et al.*, 2018). Smaller percentage had thyroid problems; in internal medicine, the association between thyroid dysfunction and type 2 Diabetes Mellitus is evident (Arthritis and Diabetes, 2016; Chaoxun Wang, 2013).

The majority of the hypertensive patients and diabetics were diagnosed since 1-6 years of the study as seen. In Iraq, hypertension and type 2 Diabetes Mellitus screening in PHCs start 2010 and for this reason most of the cases diagnosed in 2010-2017, or may because the rising prevalence of type 2 diabetes in the Eastern Mediterranean Region; & Iraq is one of them (Hage *et al.*, 2011). It is estimated that as many as three out of every four people with diabetes are diagnosed while the remaining one is missed (Murtadha Kadhim Yasir *et al.*, 2018). Also the USAID National Primary Health Standards of Care PHPCI collaborated with the MOH was revised and finalized seven clinical guidelines selected as priorities by the MOH. The topics of these guidelines include: Diabetes Mellitus, Hypertension, and training on those guidelines (USAID/PHCPI, 2012). High percentage of the participants was visiting health institutions other than PHC; the majority was visiting private health institution. Lacking of HbA1c in the PHC and drugs for only 10 days after conformation of the diagnosis of NIDM and HT, and taking fees to have examined and treated, as IMOH instruction latterly; give bad feedback on the NCD patients regular visits to PHCs, and they prefer to go directly to private health institution and even secondary hospital other than visiting to the PHCs and referred to secondary hospital and either to have the treatment or not. Effective communication between physician and patient depend in part on physician's confidence in his/her ability to teach and enhance patient skills as well as the time available for providing services; therefore the vast majority of the

participants thought they receive good counseling, 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 counseling. As receiving health education about life style modification is important and its one component of management of chronic disease especially NIDM and HT (Lenny Lopez, 2009). In this study very small percentage revealed receiving poor health education; this is either due to shortage of the doctors or crowding PHC.

In this study, Morisky scale showed large proportion of the studied patients with low compliance. This is in contrast with a study in Lebanese hypertensive patients using Morisky scale in which 50% of them show high adherence (Healthcare Benchmarks, 2013). The overall patient's compliance less than one third of the participants showed full adherence. This percentage is a little higher than study in Iraq showed that less than a quarter of the surveyed hypertensive patient reported full adherence to their medications (Yassine *et al.*, 2015). Another study in Ethiopia the overall adherence in hypertensive patients was only 23%, (Sadeq *et al.*, 2007) as well as in Bangladeshi study (Tibebu *et al.*, 2017) that measure the non adherence in diabetic patients was 89%, this is also consistent with a publication of the WHO 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 (Islam *et al.*, 2017). Another study done in Babylon showed good compliance with treatment was present in only 24.8% of the sample and 57.9% had poor compliance (Safaa Hashim *et al.*, 2015). Indeed, as many as 60% of persons with chronic disorders are poorly adherent to treatment.⁽⁴³⁾ Other study, as the single-item rating scale indicated, medication compliance and non-compliance were reported in 75.4% and 24.6% of the patients, respectively (Dunbar-Jacob *et al.*, 2001). About two thirds of the studied patients had uncontrolled blood pressure; that could be due to stress of questioning, waiting and white coat hypertension. A study in USA which had approximate result gave another explanation, in which participants who reported adherence to life style modification and treatment had higher mean systolic blood pressure, their explanation for this association was that patient with poorly controlled blood pressure are more motivated to adhere to recommendations. Also two thirds of NIDM patients had uncontrolled NIDM, Which is the same percentage of hypertensive patients in this study, In A representative number of prospective cohort studies clearly indicate that cardiovascular morbidity and mortality is significantly increased in type-2 diabetic patients in comparison with non-diabetic control subjects, (Shamsi *et al.*, 2014) for this reason we must planning to increase controlling of NIDM and HT. 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. But the analysis of patient subjective report has been problematic, since patients who reveal they have not followed treatment advice tend to describe their behavior accurately whereas patient who deny their failure to follow recommendations report their behavior inaccurately who adherence. 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 (Scherthaner, 1996). Many studies have suggested that the non-adherence 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, medications costs, and physician-patient relationship (Scherthaner, 1996). According to the Morisky scale of compliance, there is statistically significant relationships between Morisky scale of compliance and participant's visits to other than PHC, but not with the age, gender, educational level, and marital status. This result is similar to study in Botswana (Francesco Napolitano Paola Napolitano Italo Francesco Angelillo, 2016). Also there is statistically significant relation between tablet-count and patients life modification. Pill count considered as routine clinical practice and primary nonadherence, its advantages: low cost, simple, can be used in various formulations and highly accurate (Rwegerera *et al.*, 2018). The key finding of this study showed that the overall compliance is significantly associated with participant visiting other than PHC. Many reasons could be behind this, firstly the health needs of Iraqis have been changed considerably in recent years in addition to basic primary health care service there is growing need for chronic and non communicable diseases services. USAID (PHCPI) in 2011 demonstrated weaknesses in PHC capacity to provide these services (Wai Yin Lam *et al.*, 2015). A second challenge is the lack of supplies and equipment, with frequent stock outs for essential drugs and lab supplies in local PHC. Although the first line of 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. As well, Medication adherence 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 percent, according to "Medication Adherence in America". In addition in Iraq as in most of Middle East NCD care is typically provided by specialist with little involvement of PHC (USAID Primary Health Care Project in Iraq (PHCPI) Baseline assessment report 2011). There is direct association between the overall compliance and good communication skills as the care provider-patient relationship and care provider communication skills are important factors to affect adherence (WHO 2018). This was not similar to a study in Al-Medina Al-Monawara in which a satisfactory patient -physician relationship was reported by only 14.4% of patient with fair to good compliance (Stephen A. Brunton, 2011). Controlled blood pressure is significantly associated with patients visiting other than PHC. The reason could be attributed to the complexity of medical regimen, multiple doses, previous treatment failure and the shortage of medication in the PHC; as mono therapy, fewer side effect, fewer daily doses all been associated with better compliance according to WHO (Islam *et al.*, 2017). The majority of studied sample is distributed between control and stage 1 hypertension with little dominance of stage1 hypertension nearly in most parameter, even in those with good communication, and good health education. This is similar to Sadeq and Lafta study 2017 (Yassine *et al.*, 2015). And Babylon study 2015 (Safaa Hashim *et al.*, 2015). In contrast to our study in which no demographic feature showed any significant relationship to NIDDM control; being older age, having higher education &having more comorbid diseases

were factors for better diabetic treatment in China (Manal Ibrahim Hanafi Mahmoud, 2012). Not-controlled NIDDM is clearly dominant in nearly all demographic parameter, even in those with well life modification, received good HE, and good communication skill. In addition if we sum not controlled NIDDM, a red flag of about two third of the sample are with uncontrolled NIDDM, and increase risk, of complication, morbidity, mortality and cost spend need. Type 2 Diabetes Mellitus is still a leading cause of cardiovascular disease (CVD), amputation, renal failure, and blindness (Meiqin Hu *et al.*). The largest proportions of the patients were overweight or obese and less than one third lost their weight since diagnosed. This is consistent with CCS for WHO which showed that 60% of adult population was overweight and 33% were obese (The National Strategy for Prevention and Control of Non-communicable Diseases, 2017). Most people who have type 2 diabetes are overweight and Diabetes is a leading cause of early death, CHD, stroke, kidney disease, and blindness (Itamarraz, 2013).

Limitation of the study

Several limitations of this study deserve to be mentioned.

Firstly: considering the limited time and small sample size.

Secondly: other important risk factors (co-morbid chronic diseases, regularity of visits and patient income) were not included in this study which might also be associated with patient compliance

Thirdly: poor testing condition in local PHC, random or fasting blood sugar without other glycemic index (HbA1c) was used to measure adherence to treatment and those might not be enough to measure drug adherence.

Conclusion

1. Three scales used to measure patients adherence to treatments and life style modification Self report/Morisky Scale (MMAS), Tablet accounts and Pill identification test
2. Near one third of the respondents only had good overall compliance and about two thirds of the respondents had uncontrolled hypertension as well as D.M.
3. Patients who were attending other than PHC had better overall compliance as well as better blood pressure measurement.
4. Good communication skills had direct association to the overall compliance.

Recommendation

1. Improving adherence is the most effective way of improving health outcome.
2. Develop educational sessions that focus on lifestyle modification, drug adherence and ongoing support for the patients, group educational courses in PHC and special health education programs through the media.
3. Improving our PHC system by enhancing the efforts to integrate D.M and Hypertension treatment into PHC services and to increase drug supplement for a whole month and provide all the detailed investigation needed to motivate the patients.

4. Strength the trusting physician-patient relationship by improving the quality of the clinical environment for the physician, managing doctors' shortage to decrease crowding and provide enough time and privacy for better physician - patient communication.
5. Updated training courses especially for the new doctors on D.M and hypertension guidelines, counseling and health education.

REFERENCES

- Access to essential medicines and technology WHO 2018, WHO/NMH/NVI/18.3. <http://apps.who.int/iris/bitstream/handle/10665/260420/WHO-NMH-NVI-18.3-eng.pdf;jsessionid=393E68D9D8E1E15599713460EAB9773C?sequence=1>
- Additional types of neuropathy. American Diabetes Association. Accessed July1, 2018. <http://www.diabetes.org/living-with-diabetes/complications/neuropathy/additional-types-of-neuropathy.html>
- Adherence to long –term therapies: evidence for action, WHO 2003 report. http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf
- Albert W D, Vecihi Batuman, Epidemiology of hypertension. *Medscape/* Updated Dec 29, 2014. <https://emedicine.medscape.com/article/1928048-overview>
- Annual Report: USAID /Primary health care project in Iraq (USAID/PHCPI) 2012. <http://phciraq.org/sites/phciraq.org/files/Annual%20Report%202012.pdf>.
- Arlan L. Rosenbloom, Janet H. Silverstein, Connective tissue and joint disease in diabetes mellitus. *Endocrinology and Metabolism Clinics of North America* Jul 1996. Vol. 25, Issue 2, P: 473–483. https://www.researchgate.net/publication/14403009_Connective_tissue_and_joint_disease_in_diabetes_mellitus
- Arthritis and Diabetes, What do diabetes and arthritis have in common? -Plenty. *Arthritis foundation web site*, 2016. <https://www.arthritis.org/living-with-arthritis/comorbidities/diabetes-and-arthritis/>
- Ataur R. Khan, Zaki N. Al-Abdul Lateef, Mohammad A. Al Aithan, Montaser A. Bu-Khamseen, Ibrahim Al Ibrahim, Shabbir A. Khan. *J Family Community Med*. 2012 Jan-Apr; 19(1): 26–32. Doi: 10.4103/2230-8229.94008. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3326767/>
- Chaoxun Wang, the Relationship between Type 2 Type 2 Diabetes Mellitus and Related Thyroid Diseases. *J Diabetes Res*. 2013; 2013: 390534. Published online 2013 Apr 4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3647563/>
- Conn V S, RN, FAAN, Todd M. Ruppard, Maithé Enriquez, Pamela S. Cooper, Patient-Centered Outcomes of Medication Adherence Interventions: Systematic Review and Meta-Analysis. School of Nursing, University of Missouri, Columbia, MO, USA. Value in health; 19(2016)277 – 2 8 5. <http://dx.doi.org/10.1016/j.jval.2015.12.001>
- Constitution of WHO: principles. <http://www.who.int/about/mission/en/>
- Crowley M, et.al. Tailored case management for diabetes and hypertension (TEACH-NIDM) in a community population: Study design and baseline sample characteristics. *Contemp Clin Trials*. . 2013 September; 36(1): page 1-8. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3828629/pdf/nihms519381.pdf>
- Davidson's Principles and Practice of medicine. Elsevier Ltd. 23rd Edition, 2018, chapter 20, page 726 and 743. Online 2018. <https://www.elsevier.com/books/davidsons-principles-and-practice-of-medicine/ralston/978-0-7020-7028-0>
- Dunbar-Jacob J, Mortimer-Stephens MK, Treatment adherence in chronic disease. *Journal of Clin Epidemiol*. 2001 Dec; 54 Suppl 1:S57-60. <https://www.ncbi.nlm.nih.gov/pubmed/11750211>
- Francesco Napolitano Paola Napolitano Italo Francesco Angelillo, Medication adherence among patients with chronic conditions in Italy. *European Journal of Public Health*, Volume 26, Issue 1, 1 February 2016, Pages 48–52, <https://academic.oup.com/eurpub/article/26/1/48/2467376>
- Guideline for Type 2 Diabetes Mellitus and Metabolic Syndrome Management. Iraq 2012. http://lms.phciraq.org/sites/default/files/ncd_diabetes_and_metabolic_syndrome_english.pdf
- Hage M, Zantout MS, Azar ST. Thyroid Disorders and Diabetes Mellitus. *Journal of Thyroid Research*. 2011; 2011: 439463. doi:10.4061/2011/439463. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3139205/>
- Hanady M, Abu Hadeed. Prevalence of Depression among Diabetic Patients. Thesis for an-Najah national university/ master degree of community mental health nursing. 2014. <https://repository.najah.edu/bitstream/handle/20.500.11888/6828/Hanady%20Hadeed.pdf?sequence=1&isAllowed=y>
- Healthcare Benchmarks2013: Improving Medication Adherence report. Healthcare intelligence network. http://www.hin.com/library/2013HealthcareBenchmarksMedicationAdherence_previe w.pdf
- Islam SMS, Biswas T, Bhuiyan FA, Mustafa K, Islam A. Patients' perspective of disease and medication adherence for type 2 diabetes in an urban area in Bangladesh: a qualitative study. *BMC Research Notes*. 2017; 10:131. Doi: 10.1186/s13104-017-2454-7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5361713/pdf/13104_2017_Article_2454.pdf
- Itamarraz, guideline approach to therapy in patients with newly diagnosed type 2 Diabetes. *Care.diabetesjournals.org*. Diabetes care, Vol. 36, Suppl. 2, August 2013. http://care.diabetesjournals.org/content/diacare/36/Supplement_2/S139.full.pdf
- Katrina Donahue, Sam Weir, Mary Roederer, and Evie Sigmon, Lippincott Williams and Wilkins, a Wolters Kluwer business2012. Essential of family medicine book, Diabetes, Chapter 13, page 151. http://simidchiev.net/lubokirov/Essentials_of_Family_Medicine_Sloane.pdf
- Lenny Lopez E. Francis Cook Mark S. Horng LeRoi S. Hicks, Lifestyle Modification Counseling for Hypertensive Patients: Results From the National Health and Nutrition Examination Survey 1999–2004. *American Journal of Hypertension*, Volume 22, Issue 3, 1 March 2009, Pages 325–331. <https://academic.oup.com/ajh/article/22/3/325/131521>
- Leslie WD, et al. Diabetes and bone disease. In: *Endocrinology and Metabolism Clinics*. Philadelphia, Pa.: Saunders Elsevier; 2016. Accessed July1, 2018. <http://www.clinicalkey.com>
- Manal Ibrahim Hanafi Mahmoud, Compliance with treatment of patients with hypertension in Al-madinah Al-munawwarah: A community-based study, *Journal of Taibah university medical sciences*, 2012, 7(2), 92-98. https://ac.els-cdn.com/S1658361212000297/1-s2.0-S1658361212000297-main.pdf?_tid=8e9c5712-7e59-46b9-a1a6-9f3d56a37797&acdnat=1530834922_2dc ccc5afaba15131fef99d36dc8692f
- Mayo Clinic staff, Bone and joint problems associated with diabetes. Accessed July1, 2018. <https://www.mayoclinic.org/diseases-conditions/diabetes/in-depth/diabetes/art-20049314>
- Megari K. Quality of life in chronic disease patients. *Health psychology research*. 2013; 1(3): e 27. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4768563/>
- Meiqin Hu, Yi Wan, Lifan Yu, Jing Yuan, Yonghong Ma, Bin Hou, Xun Jiang and Lei Shang. Prevalence, Awareness and Associated Risk Factors of Diabetes among Adults in Xi'an, China. *Scientific report*, 7: 10472. <https://search.proquest.com/openview/8f0bffc89a980b7d73b919c37e484abe/1.pdf?pq-origsite=gscholar&cbl=2041939>
- Morisky DE, Ang A, Krousel-Wood M, Ward HJ. Predictive validity of a medication adherence measure in an outpatient setting. *J Clin Hypertens (Greenwich)*. 2008; 10(5):348-54. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2562622/>
- Murtadha Kadhim Yasir, Alaa Hussein Abed, Ali Jern Hasson, Evaluation of early detection of hypertension and type 2 Diabetes Mellitus in primary health centers in al-Nasiryah city. 2016 thesis. Accessed July1, 2018. <http://utq.edu.iq/Magazines/ce2017pdf/62.pdf>
- National Guidelines for Primary Health Care Physicians, Hypertension Prevention, Diagnosis, and Treatment Directorate of Public Health Non-Communicable Diseases Section June, 2012

- Iraq. http://lms.phciraq.org/sites/default/files/ncd_hypertension_english.pdf
- NHLBI Health Topics [Internet]. Overweight and Obesity, Last Update: June 11, 2014. Access in July 2018. <https://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0063069>
- Nieuwlaat R, Wilczynski N, Navarr o T, et al. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev.* 2014; 11: CD000011. <https://www.ncbi.nlm.nih.gov/pubmed/25412402>
- PHIC- MOH, Palestinian Health Information center, in Ghazza, Palestine/ annular center, 2015. https://www.site.moh.ps/Content/Books/FDVFRuU5ORaxrOaq4C5Q987a3GBwIIDpumLafURDQJcT7ggdf9Yk13_UEpLZXH64SsaOSyrQeQIET70ljGkpE1QXz48MqImMZXIgFpARQZQdE.pdf
- Raynald Pineault, Roxane Borgès Da Silva, Sylvie Provost, Michel Fournier, Alexandre Prud'homme, and Jean-Frédéric Levesque, Do Gender Predominant Primary Health. *Health Care Organization, Provision, and Financing*, 2017, Volume 54: 1-9. <http://journals.sagepub.com/doi/pdf/10.1177/0046958017709688>
- Romesh Khardori, Type 2 Type 2 Diabetes Mellitus Treatment and Management. *E-medicine. medscape.com*, Mar 06, 2018. <https://emedicine.medscape.com/article/117853-treatment>
- Rwegerera G M *et. al.* Antidiabetic medication adherence and associated factors among patients in Botswana; implications for the future. *Alexandria Journal of Medicine*, 2018, Vol. 54: 103–109. <https://reader.elsevier.com/reader/sd/8FA52A13FF64A5C389766A7F5A278F1AA51BB45E7098B56557CA88245D5A7E2D2DE7C687F6ADD7FA4D115759711C9606>
- Sabate E, ed. Adherence to Long-Term Therapies: Evidence for Action. Geneva, Switzerland: World Health Organization; 2003. Copyright 2015 American Medical Association. <http://apps.who.int/iris/bitstream/handle/10665/42682/9241545992.pdf?sequence=1>
- Sabate E. WHO Adherence Meeting Report. Geneva, World Health Organization, 2001. http://www.who.int/chp/knowledge/publications/adherence_Section1.pdf
- Sadeq R, Lafta R K, Knowledge, attitude and practice about hypertension in hypertensive patients attending hospitals in Baghdad, Iraq. *South East Asia Journal of Public Health*, 2017; 7(1):29-34. <https://www.banglajol.info/index.php/SEAJPH/article/viewFile/34676/23379>
- Safaa Hashim, Abbas Alsallami, Ali Abdulridha Kadhim Abutiheen, Hypertensive Patients Compliance with Medications in Marjan Teaching Hospital/ Babylon. *Medical Journal of Babylon* Vol. 12- No. 3: 592-602, 2015. <http://www.medicaljb.com>
- Sanaullah Panezai, Mokbul Morshed Ahmad and Saqib S E, Factors affecting access to primary health care services in Pakistan: a gender-based analysis. *Development in practice* 2017, Vol. 27, NO. 6, 813–827. <https://doi.org/10.1080/09614524.2017.1344188>
- Schernthaner G, Cardiovascular mortality and morbidity in type-2 diabetes mellitus. *Diabetes Research and Clinical Practice*, Volume 31, Supplement, July 1996, Pages S3-S13. <https://www.sciencedirect.com/science/article/pii/S0168822796012247>
- Shamsi A, Khodaifar F, Arzaghi SM, Sarvghadi F, and Ghazi A. *Journal of Diabetes and Metabolic Disorders* 2014, 13:96 Page 6 of 6. <http://www.jNIDMdonline.com/content/13/1/96>
- Shamsi A, Khodaifar F, Arzaghi SM, Sarvghadi F, Ghazi A. Is there any relationship between medication compliance and affective temperaments in patients with type 2 diabetes? *Journal of Diabetes and Metabolic Disorders*. 2014; 13:96. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4180133/>
- Steel G., Nwokike J., Joshi M. 2007. Development of a Multi-method Tool to Measure ART Adherence in Resource-Constrained Settings: The South Africa Experience. Submitted to the U.S. Agency for International Development by the Rational Pharmaceutical Management Plus Program. Arlington, VA: Management Sciences for Health. <http://apps.who.int/medicinedocs/documents/s21890en/s21890en.pdf>
- STEP wise approach to chronic disease risk factor surveillance, Iraq 2015. http://www.who.int/ncds/surveillance/steps/Iraq_2015_STEPS_Report.pdf
- Stephen A. Brunton, Improving Medication Adherence in Chronic Disease Management, Supplement to the Journal of Family Practice, April 2011 · Vol. 60, No. 04 Suppl: S1-S8. <https://www.medge.com/jfponline/article/76635/health-policy/improving-medication-adherence-chronic-disease-management>
- The National Strategy for Prevention and Control of Non-communicable Diseases. Republic of Iraq Ministry of Health, Baghdad. 2013-2017. http://apps.who.int/iris/bitstream/handle/10665/113230/CCS_Iraq_2012_EN_14959.pdf?jsessionid=7E2991F5413761993085961F89B018DA?sequence=1
- Thompson M E and Noel Mary Barth, *Lippincott Williams and Wilkins, a Wolters Kluwer business*, 2012. Essential of family medicine book, Nutrition and Weight Management, Chapter 15 page. 180. http://simidchiev.net/lubokirov/Essentials_of_Family_Medicine_Sloane.pdf
- Tibebu A, Mengistu D, Negesa L. Adherence to recommended lifestyle modifications and factors associated for hypertensive patients attending chronic follow-up units of selected public hospitals in Addis Ababa, Ethiopia. *Patient preference and adherence*. 2017; 11: 323-330. doi:10.2147/PPA.S126382. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5338986/>
- USAID Primary Health Care Project in Iraq (PHCPI) Baseline assessment report 2011. <http://www.urc-chs.com/resources/baseline-assessment-report-2011-primary-health-care-project-iraq-usaidphcpi>
- USAID/PHCPI and Ministry of Health/ Iraq ministry of health, Guideline for Type 2 Diabetes Mellitus and Metabolic Syndrome Management, Iraq, April 2012. http://lms.phciraq.org/sites/default/files/ncd_diabetes_and_metabolic_syndrome_english.pdf
- Wai Yin Lam, and Paula Fresco, Medication Adherence Measures: An Overview. Hindawi Publishing Corporation- BioMed Research International. Volume 2015, Article ID 217047, 12 pages. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4619779/pdf/BMRI2015-217047.pdf>
- Werner M. E, Vijver S van d, Adhiambo M, Egondi T, Oti S O., and Kyobutungi C. Results of a hypertension and diabetes treatment program in the slums of Nairobi: a retrospective cohort study. *BMC Health Services Research*. (2015) 15:512. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4650397/pdf/12913_2015_Article_1167.pdf
- Yassine M, Al-Hajje A, Awada S, Rachidi S, Zein S, Bawab W, BouZeid M, El Hajj M, Salameh P, Evaluation of medication adherence in Lebanese hypertensive patients. *J Epidemiol Glob Health*. 2016 Sep; 6(3):157-67. Doi: 10.1016/j.jegh.2015.07.002. Epub 2015 Jul 29. <https://www.ncbi.nlm.nih.gov/pubmed/26232704>
