

TURKISH REPUBLIC OF NORTH CYPRUS NEAR EAST UNIVERSITY INSTITUTE OF GRADUATE STUDIES

ADHERENCE, SATISFACTION AND DIABETIC SELF-CARE ACTIVITY AMONG DIABETIC PATIENT IN ERBIL, IRAQ

By:

RAWEN ABDULHADI ABDULLAH

MASTERS

A THESIS SUBMITTED TO THE INSTITUTE OF GRADUATE STUDIES NEAR EAST UNIVERSITY

CLINICAL PHARMACY

2021-NICOSIA



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2021-NICOSIA

DEDICATION

I dedicate my dissertation to my family and a number of friends who help me for their constant support and interest with words or a smile.

My caring parents, who have always support me unconditionally, they were with me till that day for achieving my goals and I never forget this goodness that they did with me.

My wife and siblings have always supported me and are very unique.

I dedicate this job to my best teacher and give huge thanks.

Assist. Prof. Dr. Abdikarim M. Abdi

I also dedicate my co adviser who helped me unconditionally

Dr. Suha Saeed Shangula

I also want to dedicate this study, who support my from first day till I finishing my studying this is my wife, I am deeply grateful that I have you in my life

Approval

We certify that we have read the thesis submitted by Rawen Abdullah titled "Adherence, satisfaction and diabetic self-care activity among diabetic patient in Erbil, Iraq" and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Health Sciences.

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Abstract

Introduction: Diabetes mellitus (DM) prevalence is continuously growing, around 90% of diabetic patients are type 2. Diabetes is high rates of morbidity and mortality especially among patients which has low adherent or non adherent to their medications. Patient Satisfaction with Information about Medicines Scale plays a vital role in the quality, provision and accessibility of healthcare services, a significant relationship among adherence to medication and also regular self-care activities play an important role in obtaining positive health outcomes related to diabetes.

Aim: To assess quality of counseling information among DM patients receiving diabetic medications from physician and pharmacist, along with patient adherence to diabetic medications and the impact of counseling on clinical outcomes and self-care activities.

Method: A cross sectional, descriptive, face-to-face, closed ended, questionnaire study was conducted in Layla Qasim diabetic center and Ashty hospital between the first of October 2020 to end of January2021. Patient's demographic information was gathered along the Satisfaction with Information about Medicines Scale (SIMS), brief Morisky Medication Adherence Scale (MMAS) and diabetic self-care activity were all collected by using the structure of validating questionnaires tools.

Result: Among 203 diabetic patients, 150 patients accepted and were eligible to the study participation. Patients who participated in the study involved 80 (52.3%) male and 70 (46.7%) female. Considering the Morisky scale, patients with high adherence showed a significantly lower Hba1c than non-adherent patient (p<0.05). According to diabetic self-care activity 56(37.3%) of the patients who obeyed the healthful eating plan for the previous week for more than 4 days. Patients were more satisfied with the action and usage of medications than potential side effects of the medications which is statically significant (p < 0.001).

Conclusion: The patients' adherence to their anti-diabetic medications was suboptimal in this study, Patient adherence to their medications was suboptimal, non adherent patients had higher level of Hba1c and FBG comparing to adherent patients, indicating that better adherence leads to better diabetic control. Satisfaction of patients for indication and usage of anti-diabetic medications were higher than potential side effect. Generally enough counseling wasn't provided by health care providers to patients.

Key Words: Diabetes, counseling information, medication adherence, self-care activity, patient satisfaction.

STATEMENT (DECLARATION)

Hereby I stated this is my thesis I had written by my own hands, I didn't do any un ethical things during writing up my thesis, I got all information by academic phases and with no unethical rules and about references the all information I had got it I mentioned the references in the reference list with no copyright infringement in my studying.

Rawen Abdullah

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LIST OF ABBREVIATIONS

S. #	ABBREVATIONS	EXPLANATION
1	СР	Clinical Pharmacy
2	PC	Pharmaceutical Care
3	FDA	Food and Drug Administration
4	HTN	Hypertension
5	CVD	Cardiovascular Disease
6	T2DM	Type two diabetes mellitus
7	T1DM	Type one diabetes mellitus
8	GDM	Gestational diabetes mellitus
9	НСР	Health care provider
10	TG	Triglyceride
11	Hba1c	Glycated hemoglobin (A1c)
12	NEU	Near East University
13	WHO	World Health Organization
14	SPSS	Statistical Package for the Social Science
15	SD	Standard Deviation
16	IDF	International Diabetes Federation
17	AACB/ACE	American association of Clinical Endocrinologists and American
		College of Endocrinology
18	FPG	fasting plasma glucose
19	SOC	standard of care

20	MEMS	Medication Electronic Monitoring System	
21	SIMS	Satisfaction with Medicine Scale Information	
22	ADA	American diabetes association	
23	OHA	Oregon Health Authority	
24	IHD	Ischemic heart disease	
25	Cr.Cl	Creatinine clearance	
26	EDTA	Ethylenediaminetetraacetic acid	

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1. Introduction:

Diabetes mellitus (DM) prevalence is continuously growing. Around 90% of these cases are type 2 diabetes, the high rates of morbidity and mortality because of DM, reflect a growing health issue worldwide (Al-Qazaz et al., 2011). The prevalence worldwide of diabetes in 2019 was approximately 9.3 percent (463 million individuals), rising to 10.2 percent (578 million individuals) by 2030 and 10.9 percent by 2030 and 10.9 percent by 2030. (700 million individuals) in 2045. The incidence is greater in city areas (10.8%) than in farming areas (7.2%) (Saeedi et al., 2019). The World Health Organization has estimated that 1, 5 million individuals died in 2012 because of diabetes. An accession 2.2 million individuals died because of their blood glucose level higher-than-optimal blood glucose, raising the chances of cardiovascular and other diseases. (Organization, 2016). In 2007, the incidence of diabetes in Iraq reached epidemic proportions, affecting approximately 2 million individuals, or 7.43 percent of the total Iraqi population (Mansour, Wanoose, Hani, Abed-Alzahrea, & Wanoose, 2008). People with diabetes have a high chance of having different severe health problems; multiple organs can actually be affected by the low degree of glycemic control. Cardiovascular disorders, loss of vision, renal illness, and lower limb amputation are the main causes of unregulated blood glucose. Patients must be adhered to their medications in order to reduce this chance of further diabetic complication incidents. In minimizing diabetic complications, anti-diabetic treatment, screening as soon as possible, diagnosis, supporting a balanced diet, conducting a daily checkup and education about diabetic wellness are essential (Yazew, Walle, & Azagew, 2019).

To conclude, this thesis project assesses the current available information regarding overview of

Diabetes mellitus, treatment adherence, patient satisfaction, diabetic self-care activity, relationship between some parameters: Hba1c, creatinine clearance, Triglyceride and cholesterol with adherence, beside patient satisfaction, diabetic self-care activity and adherence to drug therapy. We also test the hypothesis if there is any relationship between some parameters: Hba1c, creatinine, Triglyceride and cholesterol and the patient's adherence to their medications and some demographic characteristic.

1

2. Background:

2.1 Diabetes is metabolic disorder that lead to rise glucose level due to defect in insulin releasing ,insulin action, or both of them ,long-term hyperglycemia in diabetic patient is associated with different types of complications such as microvascular and macro vascular, examples of the microvascular are retinopathy, neuropathy and nephropathy and macro vascular which affect heart and blood vessel (Association, 2014). The American Diabetes Association, has classified DM into four major categories:

1. Form 1 DM (T1DM), also referred to as insulin-dependent DM

2. Form 2 DM (T2DM), also referred to as non-insulin-dependent DM

3. DM gestational (GDM)

4. Diabetes is caused by other complications, for instance hormonal conditions or medication.

Either the adipose tissue becomes immune to insulin in T2DM or the pancreatic cells are affected, resulting in less release of insulin. Both situations cause an uncontrolled more glucose in the blood vessels when the tissue starves at the same moment (Association, 2016).

2.1.1 Type one diabetes (T1D) is a T-cell-mediated autoimmune condition in which insulin deficiency leading to hyperglycemia and ketoacidosis is triggered by the loss of pancreatic β -cells. T1D patients make up 5-10% of all people with diabetes. High glucose levels must be controlled throughout the day by exogenous insulin injections (Kahanovitz, Sluss, & Russell, 2017). Different autoimmune markers are used to identify type 1 diabetes. These comprise islet cell autoantibodies and insulin autoantibodies, GAD (GAD65), IA-2 and IA-2b tyrosine phosphatases, and ZnT8 the disorder has powerful HLA associations, related to the genes DQA and DQB. These HLA-DR/DQ alleles could be either predisposing or defensive. The rate of destruction of b-cell is very variable, becoming rapid in some people (primarily infants and children) and sluggish in others (mainly adults). As the first manifestation of the disease, children and adolescents can experience ketoacidosis. Others have mild fasting hyperglycemia that, with infection or other stress, can easily transform to extreme hyperglycemia and/or ketoacidosis; such individuals eventually become insulin-dependent for survival and are at risk of ketoacidosis. There is little or no insulin release at

this latter stage of the disease, as demonstrated by low or undetectable plasma C peptide rates. In childhood and adolescence, immune-mediated diabetes typically happens, but it can appear at any time, including in the 8th and 9th decades of life. B-cell autoimmune destruction has numerous genetic predispositions and is often attributed to still poorly describe environmental factors. While patients are not usually obese because they have type 1 diabetes, diagnosis cannot be avoided by obesity. Other autoimmune diseases such as Hashimoto thyroiditis, celiac disease, Graves' disease, Addison disease, vitiligo, autoimmune hepatitis, myasthenia gravis, and pernicious anemia are often susceptible to such patients (Association, 2016).

2.1.2 Type two Diabetes Mellitus (T2D)

Diabetes mellitus of type two is caused by either a lack of insulin or cell resistance to insulin. Many individuals aged over 30 have been diagnosed with T2DM. Advanced age, inheritance, race, obesity, diet, and previous GDM are the main risk factors. So according to ethnic factors, Hispanics, Asian Americans and black people are more vulnerable, according to the (ADA). T2DM was verified by all participants in this project and T2DM was considered to be over 6.5% HbA1c. T2DM's pathophysiology is not very clear, but it operates in families, while genetic science also isn't completely understood (Association, 2017). Symptoms Type 2 diabetes generally can be identical to type 1 diabetes, including, in particular, increased appetite, increased urination, weakness, delayed wound healing, persistent infections, and hand and foot tingling or numbness (IDF, 2017). As the number of insulin-producing cells decreases, the death of the B-cell in T2DM begins, insulin resistance will be one the growing. T2DM is associated with a disorder in the cells' ability releasing insulin and is exacerbated by inflammation and metabolic problems. Diagnosing of T2DM is on two different occasions while fasting plasma glucose (FPG) is 126 mg/dL or HbA1c is 6.5 percent. It is important to take into account other factors that may influence levels, like age, race, and anemia, when HbA1c is the base and used to diagnose T2DM. It has been found, for example, the level of HbA1c in black individuals can have a higher than in other races (Association, 2017).

2.1.3 Glycosylated Hemoglobin A1C

From over prior eight to 12 weeks, HbA1c represents average plasma glucose, can be carried out at any period of the day and does not need any training for instance fasting. These features have made it the favored tool for measuring glycemic regulation in diabetic individuals (Organization, 2011). HbA1c is also accepted as a standard of care (SOC) for diabetes checking and evaluation, especially type 2 diabetes. Proteins are often glycated whenever the conditions are physiologically desirable during different enzymatic reactions. In the case of hemoglobin, indeed, glycation is the result of a non-enzymatic reaction between the glucose and the N-terminal end of the β -chain, which structures the Schiff base during the reorganization, transforming the Schiff base into Amadori products, the best known of these is HbA1c. In a reversible reaction, hemoglobin and blood glucose recombine to form Aldimine in the primary stage of glycated hemoglobin production. Aldimine is eventually converted into the stable ketoamine form in the secondary stage, which is irreversible. In order of prevalence, the main sites of hemoglobin glycosylation are β -Val-1, β -Lys-66, and β -Lys-61. Natural adult hemoglobin consists primarily in composition 97 percent, 2.5 percent, and 0.5 percent, respectively, of HbA (alpha $2\beta 2$), HbA2 (alpha $2\delta 2$), and HbF (alpha $2\gamma 2$). Approximately 6% of the total HbA is known as HbA1, which in turn consists of fractions of HbA1a1, HbA1a2, HbA1b, and HbA1c, identified by their electrophoretic and chromatographic properties. The most prevalent of these fractions is HbA1c and constitutes around 5% of the total HbA fraction in wellness. As described above, before undergoing an Amadori rearrangement to build a more stable ketoamine, glucose in the open chain format attaches to the N-terminal to build an aldimine. This is a nonenzymatic phase that happens in vivo on an ongoing basis. A natural part of the period of physiological activity is the production of glycated hemoglobin. When the average plasma glucose rises, however, so does the plasma quantity of glycated hemoglobin. (Sherwani, Khan, Masood, Ekhzaimy, & Sakharkar, 2016).

HbA1c of less than 6.5 is recommended, by the American Association of Clinical Endocrinologists and the American College of Endocrinology (AACB/ACE), if it can be managed safely and can be affordable for the patient. Naturally, the medical history of the patient must be considered (Keresztes & Peacock-Johnson, 2019).

2.2Adherence:

Although the definitions of both adherence and compliance are synonymously utilized, adherence and compliance vary from each other. "Adherence to medication is specified by the World Health Organization as "the point to which the conduct of the person corresponds to a health care provider's approved recommendations, compliance is the point to which the behavior of a patient follows the advice of the prescriber. Compliance implies obedience of the patient to the authority of the doctor, while adherence means that the patient and physician co-operate to upgrade the health of the patient with combining the medical advice of the doctor and the lifestyle, beliefs and treatment preferences of the patient (Jimmy & Jose, 2011). Previously, research performed in the field of drug adherence and diabetes was summarized (Cramer JA, 2004; Odegard PS, Capoccia K, 2007).

A systematic study by (Cramer, 2004) retrospective research found that adherence to OHA therapy measured from 36% to 93% for 6-24 months in patients staying on treatment, (Odegard and Capoccia, 2007) review showed evidence that highlights the obstacles to drug use for those with diabetes mellitus and illustrated the limited availability of successful treatments to be taken (Odegard & Capoccia, 2007).

2.2.1 Causes and identification of non-adherence

Several variables may have a constructive or negative impact on patient adherence. WHO has established that adherence can be influenced by five sets of factors (Sabaté & Sabaté, 2003).

2.2.1.1 Social and economic factors

These factors have multiple sub-factors and have an important influence on the patient's adherence level, like that of the cost of the drug, the patient's culture, wages, education, and the beliefs of the patient.

2.2.1.2 Health care team and system-related factors

Fairly few study on the impact of the team of health care and system-related adherence factors has been done. There are several variables which have a negative impact, while a strong patient-provider relationship will strengthen adherence. These include poorly designed health programs with insufficient or non-existent coverage of health insurance plans, weak delivery networks of medication, lack of information and training on chronic

disease management for health care professionals, overworked health care providers, shortage of performance rewards and input, short appointments, The system's poor capacity to instruct and follow-through patients, lack of ability to develop community support and self-management capacity, shortage of adherence awareness and successful steps to strengthen it.

2.2.1.3 Therapy-related factors

These variables are the most significant factors influencing patient adherence, including, for example, the period of the treatment, the doses, the adverse effects of the medications and the treatment regimen, in regard to the occurrence of any history of treatment failure. For instance, as the frequency of administration of the doses decreases adherence (Osterberg & Blaschke, 2005).

2.2.1.4 Patient-related factors

The resources, knowledge, behaviors, attitudes, preferences and aspirations of the patient are expressed by patient-related factors. Awareness and attitudes of patients about their disease, encouragement to control it, faith (self-efficacy) in their capability to participate in disease-management behaviors, and assumptions about the results of care and the effects of inadequate adherence, interact in ways that are not completely understood to affect adherence behavior. Among the causes reported to impact adherence related to patients are: forgetfulness; anxieties regarding potential side effects; psychosocial stress; insufficient motivation; Lack of intelligence and ability to control the symptoms and management of the disease; insufficient self-perceived need for therapy; insufficient of perceived impact of treatment; negative perceptions about the effectiveness of treatment.

2.2.1.5 Disease-related factors

Disease-related variables have a major impact on the degree of adherence, including the severity of illness and any form of disease-related impairment, the sort of symptoms and condition of the disease, and the rate of progression.

2.2.2 Adherence measurements

Before taking this judgment, the health care provider should take into account the secret causes of low adherence and to what degree, to determine how to encourage adherence may be influenced by many factors. The actual behavior of the patients is also a major factor.

Patients should have knowledge of the adherence calculation regardless of how to calculate adherence.

Overestimating is one of the limitations of applying a questionnaire to assess the adherence of the patient.

It is fast and convenient to use an electronic system to calculate the adherence defined as MEMS, consisting of a bottle which can be loaded with oral drugs and measure the duration and frequency of opening the bottle with time and date.

Another concern is posed here, these instruments measure the frequency, date and time of the bottle's opening not taking the medication, in another language, what if the patient opens the bottle and has not given the drug or has not taken the drug from the same bottle or has taken several doses of the same drug.

In addition, the cost of MEMS would not be included in health insurance and special software is used with special instructions, which in general may not be suitable for patients with a low level of education or low income.

Nevertheless, all these limitations are considered by the MEMS system as the most reliable and accurate instrument for assessing patient adherence to their medications (Abdi, Agha, Birand, & Billoro, 2019).

2.2.3 Adherence enhancement

Patient knowledge documentation and counseling can greatly improve adherence Patients with chronic condition complain more about the difficulty of adherence to medication, especially with intervention treatment because it is more complicated. Four different types are belong to intervention (Abdi et al., 2019).

2.2.3.1 Educational interventions

In addition to therapy, recording patient information and educating them about their condition is of crucial importance in improving adherence. For the enhancement of deliberate non-adherence, these measures are necessary.

In addition to the value of treatment, more knowledge of the condition and success with complications will contribute to maintaining and achieving improved adherence and following therapy advice.

In diabetes and nutrition planning, the impact of lack of effective awareness affects how people respond to the disease behaviorally (Abdulrehman, Woith, Jenkins, Kossman, & Hunter, 2016) noted that the shortage of awareness, combined with cultural practices, financial constraints and low rate of formal education, led to poor healthy diet that had a negative effect on T2DM management.

2.2.3.2 Behavioral interventions

These interventions are much more linked to the actions of the patient, such as missing the medications. The non-intentional adherence can be improved in many ways by changing patient habits such as medication boxes, cards, alarms and including family members in this intervention.

2.2.3.3 Monitoring interventions

Control the impact of medications on patients will increase patient adherence, like monitoring of blood pressure in patients were diagnosed with hypertension.

Monitoring the patients' level of adherence will strengthen and encourage it itself and improve the conduct of drug administration. The effect of Hawthorne, known as the benefits of control on performance (Abdi et al., 2019).

2.2.3.4 Pharmaceutical therapeutic interventions

These interventions are linked to the administration of the medication and simply the drug administration guidance. In rare cases, for instance, medication must be split before administered so leads to decreasing in believing of the patient to their medication and it's the causative factor to decrease adherence of the patients to their medications after splitting tablets (Abdi et al., 2019).

2.2.4 Adherence and pharmaceutical care

In diabetic diseases, pharmaceutical care has an important role in enhancing adherence. Various studies have been written claiming that the effectiveness of pharmacists rolling in patient care and adherence.

Regarding community pharmacists, studies revealed the important position of the consultation of pharmacists that contributes to more adherents in diabetic patients compared to patients who did not have consultations with any pharmacists.

In the treatment of diabetes mellitus, pharmacists are now playing a vital role. To help patients resolve obstacles to adherence, clinical pharmacists are well placed. Several research have shown that pharmaceutical care can promote adherence, self-care, and produce a net economic return in some situations (Heisler et al., 2012); (Planas, Crosby, Mitchell, & Farmer, 2009). For instance a prior systematic review examined the results of pharmacist interventions that promote adherence to oral antidiabetic drugs for type 2 diabetes mellitus, having a good impact on adherence (In 2014, Antoine, Pieper, Mathes, & Eikermann).

2.3 Diabetes self-care activity

Diabetes self-care is a personal decision performed to regulate diabetes that includes the prevention of complications and treatment (Sigurðardóttir, 2005) or Self-care is described as activity made by persons to look after better of themselves in their environmental conditions. There is really no uniform self-care terminology, but this definition is most often used interchangeably with self-management, compliance, Self-care requires a number of activities for people with T2DM that include food, exercising, taking medication (insulin or oral hypoglycemic agents), self-monitoring of blood glucose (SMBG), and foot. Self-care is considered to be a pillar of diabetes care.

To recognize and understand problem areas in T2DM management, to promote improved glucose regulation and to minimize complications of uncontrolled T2DMM, an effective evaluation of diabetes self-care is therefore important (Lu, Xu, Zhao, & Han, 2016) Regular self-care activities are essential for achieving good health outcomes related to diabetes, and several reports have documented a clinically meaningful correlation between glycemic regulation and self-care activities (St John, Davis, Price, & Davis, 2010). HbA1c is also one of the criteria used for analyzing long-term diabetes. The consistency of long-term glycemic regulation and the efficacy of therapy can be measured using HbA1c.

2.4 Patient satisfaction

It is important to provide information to patients related to their prescription medicines to encourage them for proper using and to consider the possible advantages and risks that have been recognized by the release of guidelines for providing patients with medication information, including learning how to use, such as the dosage, route of administration, In the case of missed doses or accidental overdose, and a listing with all contraindications, warnings (Horne, Hankins, & Jenkins, 2001) and side effects and otherwise, descriptions of action to be taken.

Patient satisfaction plays a vital role in the quality, provision and accessibility of healthcare services, a significant relationship among adherence to medication and satisfaction of patients with information obtained about their medicines has also been shown While healthcare providers (HCPs) have been engaged in delivering medication information, the quality and quantity of information they sometimes overestimate Patients indicated losing sufficient awareness of the signs, duration, dosage and side effects of their drugs after hospital discharge.

Only a small percentage of patients were told of medication at discharge, and an even smaller percentage (30%) reported receiving written information. Patients simply want as much knowledge about their drugs as needed. A study performed at Guy's and St Thomas' NHS Trust found that patients were substantially more pleased with the information they got about the action and use of medicines relative to the possible drug issues in the Satisfaction with Medicine Scale Information (SIMS).

Similar results were also revealed by a selected group between patients with type II diabetes mellitus as in previous research, including a lack of sufficient knowledge on side effects, drug-drug interaction and long-term impacts of their prescription drugs. (2020 Sze, Pudney, & Wei).

3. MATERIALS AND METHODS

3.1 Study Design

A cross sectional, descriptive, face-to-face, closed ended, questionnaire study.

3.2 Sampling Method

All patients who entered Layla Qasim center and Ashty hospital between October 2020 to end of January 2021 were invited.

3.2.1 Inclusion Criteria

Diabetic Patients are those that have been diagnosed with a diabetic type one and type and two and having physician confirmation, and having been prescribed medication for at least 6 months prior to the study and agreed to sign consent form were included in the study.

3.2.2 Exclusion criteria:

Selecting of exclusion of the patients only if they were pregnant women including those with gestational diabetes, and those with cognitive disabilities.

3.3 Sample size

The sample size for this analysis was determined as follow:138, based on the diabetes prevalence of 10% in Iraq, (Othman & Khurshid, 2014) using Daniel formula (Bukhsh et al., 2018) for sample size.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where n is the population sample size, Z is the statistic for a level of confidence, P is the expected prevalence or proportion and d is the precision.

The prevalence of diabetes in Iraq is 10%, so P = 0.1, while Z = 1.96 (for 95% level of confidence) and d=0.05. The patients' sample size for Erbil city was 138. However, data were collected from 150 patients.

3.4 Collection of the blood samples

Individuals who were already taking diabetic drugs had their blood samples taken, from each individual, 5 mL of blood was taken by utilizing a sterile disposable syringe, then moved to a completely labeled tube with EDTA, and then put it on the roller mixer and moving for 5 to 8 minutes for mixing blood with EDTA to prevent blood clotting ,in Layla Qasim center

all blood parameters were done by Gesan Chen 400 auto chemistry analyzer and in Ashty hospital TG ,cholesterol and creatinine were done by Kenza 240 TX automatic biochemistry analyzer and Hba1c was done by Liaison XL analyzer. These process were done by biologist.

3.5 Questionnaire Instruments

Information for this study were gathered with a survey form that consists of sociodemographical section, Brief Morisky Adherence Scale, self-care activity scale and The Satisfaction with Information about Medicines Scale (SIMS).

3.5.1 Socio-Demographical Information

This section of the survey form was developed by the researcher and it gathers the information regarding the following variables: gender, age, past medical history, level of education, Social habits, BMI (kg/m2), duration of diabetes, co-morbid condition, employment status and community as the sample of questioner as shown in (appendix I).

3.5.2 Brief Morisky Medication Adherence Scale (MMAS)

To evaluate the patient's adherence to their medications, the Brief Morisky Medication Adherence Scale (BMMAS) was used. That is considered to be one of the standard scales used to assess the adherence of patients around the world. The questionnaire consisted of 4 items: yes/no where yes =zero and no=1, the summation of the scale then related to adherence if the patient get 4 and non-adherent if less than 4. The internal consistency of the scale used to measure Cronbach alpha and found 0.75 which mean a good and reliable scale as shown in (appendix **II**).

3.5.3 Diabetic self-care activity

Eight questions were asked to report advice on self-care practices to the participants in the study (diet, exercise, smoking, drug intake, blood monitoring, and foot care). There were two answers to each question, Yes/No. Score 1 was given to each 'Yes' answer and 'No' scored 0.0. After taking the cut-off value of 6, individuals were graded as adequately advised if more than 6 and inadequately advised if less (median score). Details of self-care activities were gathered using the questionnaire Summary Diabetes Self-Care Activities produced by (Toobert, Hampson & Glasgow, 2000) after slight adjustments were made as daily blood sugar monitoring was rare, the questionnaire related to venous blood glucose checking.

Individuals with an overall grade of parameters I ii) ≥ 5 and an average score of parameters (iii, iv) m1 were identified as satisfactory dietary practice, with p5 for parameter v being categorized as satisfactory exercise practice, with yes parameter response (vi, vii, and viii) being classified as satisfactory medication intake, blood screening, and foot care practices, respectively, with no answer to parameter (ix) was classified as satisfactory smoking practice (Garg, Paul, Dasgupta, & Maharana, 2017) as shown in (appendix III)

3.5.4 The Satisfaction with Information about Medicines Scale (SIMS)

The questionnaire consist of 17 items. Items 1-9 of this questionnaire measure patients' perceived awareness and satisfaction about the consequences and use of medications. Items 10-17 analyze data about the potential side effects of the drug (Horne R et al., 2001). "Using SIMS questions, knowledge was assessed, and patients were asked to "please rate the degree to which you know the following." Response categories ranged from "knows" as 3, "partially knows" as 2 and "does not know "as 1."In addition, patients were questioned about their origin of knowledge information as follows: "What is the source of knowledge about...? The response types were as follows: doctor, pharmacist, physician, pharmacist, or otherwise. Patients were eventually asked, "Are you satisfying with the information you received about...?" "Patients were asked to rate the amount of information they were given with the following choices using an answer scale: "too much", "about right", "too little", "no obtained", "no needed" Patients who indicated that the data was " about right " or " none required " were rated as pleased and scored 1. Patients who indicated that the data was "too much "," too little "or" none received" were rated as dissatisfied and ranked 0 (Gültekin et al., 2019). Patients' answering for each item were analyzed to determine specific types of information perceived to be inappropriately addressed as shown in (appendix IV).

3.5.4.1 Healthcare provider's perspective

The assessing HCPs for practicing on SIMS for the information that they give to the patients. Six endocrinologist who specialized in diabetic disease with 16 doctor who prescribed diabetic medication and 97 pharmacists were asked to participate in this study in Erbil city in Iraq. The questions asked about SIMS information so as to understand do they give these information to the patients and who is responsible to discuss this topics with patients. A 5-point Likert scale which answered by ("always", "often "when asked", "rarely" or "never") by HCPs. The Cronbach's alpha score in SIMS for HCP was 0.862.

3.6 Statistical Analysis

All statistical data calculations and analysis carried out by Statistical Package for Social Sciences (SPSS) 20.0 software.

The descriptive of the samples were determined by using frequency analyses and percentages.

Descriptive statistics such as mean, standard deviation, IQR, median, minimum and maximum values were defined for continuous variables such as The Satisfaction with Information about Medicines Scale (SIMS), the Brief Morisky Medication Adherence Scale (MMAS) scores, blood parameters such as Hba1c and FBG.

For analyzing the normal distribution of the data in the term of normality Kolmogorov-Smirnov test of normality, Shapiro-Wilk test of normality, and Q-Q plots, required to evaluate the methods of statistical hypothesis testing.

The entire data in the study were not normally distributed that why non parametric hypothesis carried out during all analysis process.

Mann Whitney U test for the Independent samples was used for the comparison of Brief Morisky Medication Adherence Scale (MMAS) score with blood parameters such Hba1c, TG, Cholesterol and FBG and creatinine clearance,

Wilcoxon Signed ranked test was applied for two continues variables such as the standardized average of the indications and usage with comparing to standardized average potential side effect of the

The correlation of Pearson was done to evaluate the level of correlation between Morisky scale and demographic characteristics of the participant to evaluate the level of adherence and Pearson Chi-square was used for the calculations.

3.7 Ethics approval:

Ethics approval for this study was obtained from the Hawler Medical University (HMU-PH-EC 30-09-20-55). Research was conducted in accordance with the Declaration of Helsinki. Prior to study verbal informed consent was obtained from the patients.

4. Results

A among 203 patients only 150 accepted to participate in the study. The data were collected from the first of October 2020 till the fifteenth of January 2021. In addition to that 97 pharmacist with 7 endocrinologist and 16 other doctors who prescribed diabetic medications were included in this study.

4.1. Patients Characteristics

The patients who participated in the study involved 80 (53.3%) male and 70 (46.7%) female. The mean \pm SD age of the sampled group was 52.18 \pm 9.37 with 26 (17.3%) being older than 61 years old.

The education level of the sample was distributed, 55 patients (36.7%) are illiterate 56 (37.3%) has primary school degree 24 patients (16%) has high school degree and 15 patients (10%) completed their university, about employment status patient 64 (42.7%) were employed and 86(57.3%) were unemployed, the patients who lived in urban 124 (82.7%) while in rural 26 (17.3%) lived in rural, according to social habit patients who smoked cigarette 31 (20.7%) patients who drink alcohol 1(0.7%) and patients who drink alcohol and cigarette 1 (0.7%) (Table 1).

Table 1 Patient's demographic characteristics

	N	%
Gender		
Male	80	53.3
Female	70	46.7
Duration of disease		
Less than 5 years	31	20.7
5 - 9 years	59	39.3
9-15 years	34	22.7
more than 15 years	26	17.3
Education		
Illiterate	55	36.7
Primary school	56	37.3
High school	24	16
Diploma or University	15	10
Social habit		
Alcoholic	1	0.7
Smoker	31	20.7
Both	1	0.7
None	117	78
Age groups		
31-40	20	13.3
41-50	39	25
51-60	60	38
More than 61	31	23.2
BMI	- ·	
Normal	31	20.7
Over weight	80	53.3
Obese	39	26
Living status		
Urban	124	82.7
Rural	26	17.3

Employment status		
Employed	64	42.7
Unemployed	86	57.3

The sampled medical history of the patient indicates the distribution of the following comorbidities; hypertension (32.7%), hyperthyroidism 2%, Asthma 0.7%, ischemic heart disease 3.3% and kidney disease 0.7% (Table 2).

Table 2 Medical history of the patients

	N	%*
Hypertension	49	32.7
Hyperthyroidism	3	2
Asthma	1	0.7
Ischemic heart disease	4	3.3
Kidney disease	1	0.7

*The summation of percentage \neq 100. More than one disease is possible.

4.2. Adherence scale:

4.2.1 Adherence to the medications

Considering the Morisky scale, the data revealed that just 44 (29.3%) patients were selected as being adherents, while 106 patients (70.7%) were selected as non-adherents.



Figure 1. The percentage of adherence of the respondents

The mean \pm SD of age of the patients who were adherent (50 \pm 9.7) was not significantly higher than the mean \pm SD of non-adherent patients (52.76 \pm 9.18) because (p > 0.05). More female patients (25, 35.7%) were identified as adherent than male patients (19, 23.8%). The patients who had diploma degree were identified as highest percentage of adherent patients (46.7), patients who finished their primary school their adherent (32.1%), patients who finished secondary school their adherent (33.3%) while illiterate patients their adherent (20. %) but statistically not significant (p >0.05)(Table 3).

	Adherent	Non adherent	p value
	N (%)	N (%)	
Gender			
Male	19(23.8)	61(76.3)	>0.05
Female	25(35.7)	45(64.3)	/ 0.05
Age			
31-40	8 (40)	12 (60)	
41-50	12(30.8)	27(69.2)	>0.05
51-60	16(26.7)	44(73.3)	20.00
≥61	8(25.8)	23(74.2)	
Employment			
status			
Employed	18 (28.1%)	46 (71.9%)	>0.05
Unemployed	26(30.2%)	60 (69.8%)	/0.05
BMI			
Normal	15 (48.4)	16 (51.6)	
Overweight	21(26.2)	59(73.8)	p<0.05
Obese	8(20.5)	31(79.5)	
Education			
Illiterate	11(20)	44(80)	
Primary	18 (32.1)	38 (67.9)	
school			>0.05
High school	8(33.3)	16(66.7)	
Diploma or	7(46.7)	8(53.3)	
University			

Table 3. Adherent association with demographic data

According to first question of Morisky scale do you ever forget to take your medicine? 65.3% patient responded by yes and about when you feel better do you sometimes stop taking your medicine in the third Morisky question 42% patient responded by yes Figure 2.



Figure 2. The Morisky items and patients responses

4.2.2 The correlation between adherence Hba1c and FBG

The mean Hba1c of the patients was 8.35% with SD=1.81, the median, maximum and minimum of the Hba1c level =8.01, 13.30, 5.5 respectively, the mean fasting blood glucose level of the patients was 219.18mg/dL with SD=74.47, the median, maximum and minimum of the fasting glucose level = 200, 420 and 75 respectively.

Considering the Morisky scale, adherent patients Hba1c 6.84 ± 1.59 are less than Hba1c of non adherent patient 9.06 ± 0.326 which is statically significant p<0.05, adherent patients FBG level 155.5 ± 30.377 are less than FBG level of non adherent patient 245 ± 71.34 which is statically significant p<0.05 (Table 4).

	Adherent	Non adherent	P value
Hba1c	6.84 ±1.59	9.06 ±0.326	p<0.05
FBG	155.5 ±30.377	245 ±71.34	p<0.05

Table 4 Adherent association with blood parameters Hba1c and TG of the patients

4.2.3 The correlation between adherence and Cholesterol, TG and Creatinine clearance

The mean Creatinine Clearance (Cr.Cl) of the sampled group was 89.76 mL/min with SD = 18.2, the median (Min-Max) of the Cr.Cl = 90.4 (44.07-147.22).

The mean total cholesterol of the patients was 183 mg/dL with SD = 38.87, the median, maximum and minimum of the total cholesterol = 185, 303 and 99 respectively. The mean of total triglyceride of the patients was 208 mg/dL with SD = 84.39 the median, maximum and minimum of the triglyceride = 200, 561, 68 respectively.

Cholesterol of adherent patients are less than non adherent patient but it's not statically significant p>0.05, TG of adherent patients are less than TG of non adherent patients which is not statically significant p>0.05(Table 5).

 Table 5 the correlation between adherence and cholesterol, TG and Creatinine

 clearance

	Adherent	Non adherent	P value
Cholesterol	182.9 ±47.33	184 ±35.02	p>0.05
TG	199 ±81.46	212 ±85.62	p>0.05
Creatinine clearance	92.06 ±15.7	88.81±19.12	p>0.05

4.3. Diabetic self-care activity:

According to diabetic self-care activity 56(37.3%) of the patients who obeyed the healthful eating plan for the previous week for more than 4 days. 59(39.3%) of the patients had fruit and vegetable for more than 5 days. Among study participant 42(28%) ate more than one days of sweets like chocolate. 32(21.3%) patients had at least half an hour of daily activity in more than 4 days . 60(40%) among study participants measured Hba1c level in in the past 3 months, and only 40(26.7%) patients dried and checked their foot after washing their foot (Table 6).

Table 6 Self-care activity among patients

Parameter	N%
How many of the last 7 days have you followed the healthful eating plan?	94(62.7)
0-4 days	56(37.3)
5-7 days	
On how many of the last 7 days did you eat five or more servings of fruits and	91(60.7)
vegetables?	59(39.3)
0-4 days	
5-7 days	
On how many of the last 7 days did you eat high-fat foods such as red meat or full-fat	
dairy products?	66(44)
0-1 days	
>1 days	84(56)
On how many of the last 7 days did you have sweets?	108(72)
0-1 days	
>1 days	42(28)
On how many of the past 7 days did you participate in at least 30 min of physical	118(78.7)
activity? (Total minutes of continuous activity, including walking?	
0-4 days	32(21.3)
5-7 days	
Have you tested your blood sugar in past 3 months?	60(40)
Yes	
Do you take your prescribed medications daily?	128(85.3)
Yes	
Do you dry between your toes after washing daily?	40(26.7)
Yes	
Have you smoked a cigarette even one puff during the past 7 days?	118(78.7)
No	



Figure 3. The satisfactory of participant in self-care activity

4.4. The Satisfaction with Information about Medicines Scale (SIMS)

4.4.1. Patient knowledge

The majority of patients who participated in this study did know what each medicine is for" (81.3%), how to use your medicine (81.3%) and how to get further supply was (69.3%). Patients information about potential side effect are less than indication and usage which is What should you do if you forget to take a dose" (45.3%), what should you do if you experience an unwanted side effect (36.7%), and patients had lowest perceived information about whether you can drink alcohol with you medicine which is (2%). Additional results are provided in (Table 7).

Table 7. Patient-perceived therapy awareness, source of information and percentage of	f
satisfied patients for relevant items.	

Questions	Patient	S	perceived	Origin inf	ormation	of the patier	nt n %		Satisfyi
	knowled	dge n %							ng
									Patients
									%
	Know	Partial	Doesn't	Doctor	Pharm	Doctor	None	Other	Satisfyi
	S	ly	know		acist	and			ng
		knows				Pharmaci			Patients
						st			%
What is your	57	28	65	41	16	33	48	12	56
medicine called?	(38)	(18.7)	(43.3)	(27.3)	(10.7)	(22)	(32)	(8)	
What is each	122	19	9	53	13	35	19	30	82
medicine for?	(81.3)	(12.7)	(6)	(35.3)	(8.7)	(23.3)	(12.7)	(20)	
What your	48	28	74	27	5	32	77	9	25
medicine does?	(32)	(18.7)	(49.3)	(18)	(3.3)	(21.3)	(51.3)	(6)	
How your	18	12	120	13	3	15	112	7	20
medicine does	(12)	(8)	(80)	(8.7)	(2)	(10)	(74.7)	(4.7)	
Works?									
How long will	19	14	117	11	2	14	119	4	25
your medicine	(12.7)	(9.3)	(78)	(7.3)	(1.3)	(9.3)	(79.3)	(2.7)	
take to act?									
How can you tell	31	16	103	17	7	19	103	4	37
if it is working?	(20.7)	(10.7)	(68.7)	(11.3)	(4.7)	(12.7)	(68.7)	(2.7)	
How long will	95	10	45	38	17	39	37	19	65
you use your	(63.3)	(6.7)	(30)	(25.3)	(11.3)	(26)	(24.7)	(12.7)	
medications?									
Do you know	122	14	14	39	21	45	13	32	68
how to use your	(81.3)	(9.3)	(9.3)	(26)	(14)	(30)	(8.7)	(21.3)	
Medicine?									
How to get a	104	18	28	35	18	41	27	29	67
further supply?	(69.3)	(12)	(18.7)	(23.3)	(12)	(27.3)	(18)	(19.3)	

Whether the	20	19	111	7	5	16	111	11	23
medicine has any	(13.3)	(12.7)	(74)	(4.7)	(3.3)	(10.7)	(74)	(7.3)	
unwanted effects?									
What are the risks	25	20	105	0	7	23	104	8	27
what are the fisks	23	20	105	0 (5-2)	(4.7)	25 (15-2)	104	0 (5.2)	21
of you getting	(16.7)	(13.3)	(70)	(5.5)	(4.7)	(15.3)	(69.3)	(5.3)	
side effects?									
What should you	55	34	61	20	13	42	61	14	50
do if you	(36.7)	(22.7)	(40.7)	(13.3)	(8.7)	(28)	(40.7)	(9.3)	
experience									
an unwanted									
effects?									
Whether you can	3	5	142			2	147	1	3
drink alcohol	(2)	(3.3)	(94.7)	-	-	(1.3)	(98)	(0.7)	
with your									
medicine?									
Whether the	15	8	127	1	12	11	126		17
medicines	(10)	(5.3)	(84.7)	(0.7)	(8)	(7.3)	(84)	-	
interfere									
with other									
medicines									
Medications	25	22	103	8	15	17	106	4	35
make you feel	(16.7)	(14.7)	(68.7)	(5.3)	(10)	(11.3)	(70.7)	(2.7)	
drowsy?									
Whether the									
medication will	9	17	124	8	6	12	124		
affect your sex	(6)	(11.3)	(82.7)	(5.3)	(4)	(8)	(82.7)	-	38
life?									
What should you	68	20	62	20	23	33	64	10	65
do if you forget	(45.3)	(13.3)	(41.3)	(13.3)	(15.3)	(22)	(42.7)	(6.7)	
to take a dose?									

4.4.2. Patients' source of information

Patients stated that the source information about what is each medicine for (35.3%) were given by physicians which were higher than pharmacists (8.7%), about drinking alcohol with medications neither doctor alone or pharmacist alone didn't give any information, but both of them (1.3%) were given about ''Whether the medicines interfere with other medicine'' pharmacists were given more information than doctors which were (8%) and doctors (0.7%) (Table 7).

4.4.3. Patient's satisfaction

According to patients satisfactions patients were more satisfied with the action and usage of medications which the standardized average satisfaction score are 0.49 (\pm 0.14) than potential side effects of the medications which the standardized average satisfaction score are 0.308(\pm 0.13) which is statically significant (p < 0.001). Patient stated that they have high satisfaction with what is medicine for which are (82%) and had lowest satisfaction with alcohol intake with medications which are (3%) (Table 4) in this study also there were no statically significant between gender and standardized average satisfaction action and potential side effect of the medication (P =0.7, P=0.11 Respectively), and also comparing standardized average satisfaction action and potential side effect of the medication (P =0.66, P=0.91 Respectively) (Table 7).

4.4.4. HCPs' perception

4.4.4.1. Physician's perceptions about responsibility in counseling patients

According to interviews about indication and usage How long will you use your medications "doctors stated that (87%) of doctors responsible to discuss this topic, How to get a further supply "(65.2%) of doctor said doctor responsible to discuss this topic, while What your medicine does" doctors stated (78%) doctor and pharmacist responsible to discuss this topic not only doctor .and about potential side effect (65.2%) of the physicians stated that doctor responsible to discuss about Whether the medication will affect your sex life", while about Whether the medicines interfere with other medicines(56.5%) doctors stated doctors and pharmacist responsible to discuss this topic not only doctor stated that medicines interfere with other medicines(56.5%) doctors stated doctors and pharmacist responsible to discuss this topic with patients .and and doctor more

describing indications and usage of medications comparing to potential side effect but statically not significant p>0.05 (Table 8).

4.4.4.2. Pharmacist's perception about responsibility in counseling patients

Pharmacists in there interviews stated that (62.9%) of pharmacist responsible to discuss about how does your medicine works" and pharmacist responsibility alone were less about How long will you use your medications "Which are (34%) these are about indication and usage of medications while about potential side effect pharmacist stated that about Whether the medicines interfere with other medicines (47.4%) only pharmacist responsible to discuss this topic. About description of items pharmacists more satisfying to discuss indication and potential problems of medications (Table 8).

Table 8.	Frequency	table of	HCPs 1	role perc	eption a	and	how	often	they	discuss	topics
with pat	ient										

	Which	one of ther	How	often	do				
	topics?	Frequency?	describe	to	your				
		Dr			pharm		patients	these	items
							Median (IQR)	
	Doctor	pharmaci	both	Doctor	Pharmacis	both	Doctors	Pharm	nacist
		st			t			S	
What is your	12		11	6	50	41	3(2)	3(2)	
medicine	(52.2)		(47.8)	(6.2)	(51.5)	(42.3)			
called?									
What is each	14		9	6	48	43	3(1)	2(1)	
medicine for?	(60.9)		(39.1)	(6.2)	(49.5)	(44.3)			
What your	5(22)		18(78)	4	56	37	3(1)	2(1)	
medicine does?				(4.1)	(57.8)	(38.1)			
How does	7		16	7	61	29	2(1)	2(1)	
your medicine	(30.4)		(69.6)	(7.2)	(62.9)	(29.9)			
Works?									

How long will	7	16	5	57	35	2(1)	2(1.5)
your medicine	(30.4)	(69.6)	(5.2)	(58.8)	(36)		
take to act?							
How can you	13	10	3	45	49	2(1)	2(1)
tell if it is	(56.5)	(43.5)	(3.1)	(46.4)	(50.5)		
working?							
How long will	20	3	14	33	50	4(1)	3(2)
you use your	(87)	(13)	(14.4)	(34)	(51.6)		
medications?							
Do you know	17	6	7	50	40	4(2)	4(2)
how to use	(74)	(26)	(7.2)	(51.6)	(41.2)		
your medicine?							
How to get a	15	8	6	46	45	3(0.5)	3(1)
further supply?	(65.2)	(34.8)	(6.2)	(47.4)	(46.4)		
Whether the	10	13	9	47	41	3(1)	2(2)
medicine has	(43.5)	(56.5)	(9.3)	(48.5)	(42.3)		
any unwanted							
effects?							
What are the	12	11	5	41	51	3(1)	2(2)
risks of you	(52.2)	(47.8)	(5.1)	(42.3)	(52.6)		
getting side							
effects?							
What should	14	9	12	33	52	3(1)	2(2)
you do if you	(60.9)	(39.1)	(12.4)	(34)	(53.6)		
experience an							
unwanted							
effects?							
Whether you	15	8	10	37	50	3(2)	2(1.5)
can drink	(65.2)	(34.8)	(10.3)	(38.1)	(51.6)		
alcohol with							
your medicine?							

Whether the	9	1	13	6	46	45	3(1)	3(1)
medicines	(39.1)	(4.3)	(56.5)	(6.2)	(47.4)	(46.4)		
interfere with								
other								
medicines								
Medications	15		8	10	44	43	3(1)	2(1)
make you feel	(65.2)		(34.8)	(10.3)	(45.4)	(44.3)		
drowsy?								
Whether the	15		8	12	42	43	2(1)	2(1)
medication will	(65.2)		(34.8)	(12.4)	(43.3)	(44.3)		
affect your sex								
life?								
What should	13		10	4	45	48	2(1)	2(1)
you do if you	(56.5)		(43.5)	(4.1)	(46.4)	(49.5)		
forget to take a								
dose?								

5. Discussion:

The rate of diabetic disease increased during this century and the number of complications due to lack of adherence of patients with their medications so this leads to increase the rate mortality ,many studied carried out to determine the percentage of adherence and finding the solution also for increasing the rate of adherence .here several articles in several countries mainly in Nigeria ,Brazil, Malaysia and Ethiopia(Al-lela et al., 2020) .In Iraq and Erbil city the rate of diabetic increased and also blood glucose level in diabetic patients are no normal that's why determination

Adherent patients and non adherent patient and comparing with their Hba1c and other parameters are important to evaluate the effectiveness of adherence for the patient's .determination knowledge of patients about their disease and satisfying with their information also important for increasing adherence (2020 Sze, Pudney, & Wei)., determination self-care activity among patient important because it had a great effective in patients outcome (Lu, Xu, Zhao, & Han, 2016).

The patients who participated in the study more male (53.3%) than female (46.7%) similar to the study had done in Saudi Arabia (52.3%) male and (47.7%), the patients who had diploma degree were identified as highest percentage of adherent patients (46.7%)and illiterate patient had (20%) adherence which are similar to Saudi Arabia (Alqarni, Alrahbeni, Al Qarni, & Al Qarni, 2019).

In this study, two third of the patents identified as non adherent to their diabetic medications which are high risk for getting microvascular and microvascular complications .patients in Switzerland had poor adherence to their medications which were (60 %)which are similar to this study(Huber & Reich, 2016) and also in Egypt more patient were non adherent to their medications(Shams & Barakat, 2010) . but in this study sixty nine percent of patients were adherence which were different with our study (Kirkman et al., 2015)

Ages between 31-40 high percentage of adherence which where (40%) comparing to other age ranges which were similar to conducted study in Saudi Arabia the high range of adherence to their medications were less than 40 years (Alqarni et al., 2019).

Hba1c of adherent patients were less than Hba1c of non adherent patients which is similar to conducted study in Iran which were the Hba1c of non adherent patents were high comparing to non adherent patents(Jafarian-Amirkhizi et al., 2018).

FBG of non adherent patients were higher than FBG of adherent patients which is similar to conducted study in Nigeria which were the FBG of adherent patients were high comparing to non adherent patients(Pascal, Ofoedu, Uchenna, Nkwa, & Uchamma, 2012)

BMI of the patients who were obese had low percentage of adherence which were (20%) comparing to normal body mass index which they had (48.4%) of adherent for diabetic medications and which similar to conducted in Brazil which patients they had normal body weight they were more adherence to their medications (Marinho et al., 2018).

According to self-care activity (37.3%) had eating plan and (21.3%) have physical activity, (40%) had blood glucose monitoring and foot care was (26.7%) which is similar to conducted study in Iran (Jafarian-Amirkhizi et al., 2018).and which were similar in conducted study in Brazil according to diet plan and blood glucose monitoring (Marinho et al., 2018).

In this systematic review study supported self-management by the patients as increasing knowledge about their disease, about their medications, monitoring blood glucose

level and changing diet habit it had significantly effect on blood glucose level, weight and lipid profile (Norris, Engelgau, & Narayan, 2001)

According to patents satisfaction perceiving information in this study patients were more satisfying with indications and usage of the medications comparing to potential side effect which

is similar to other findings in other studies which made by using the same instrument evaluate satisfaction of the patients (Auyeung, Patel, McRobbie, Weinman, & Davies, 2011; Chan, Aspden, Brackley, Ashmore-Price, & Honey, 2020).

Health care provider responsibility in providing information to their patients, physician and pharmacist preferred to give more information about indications and usage comparing to potential side effect according to our study and most HCPs stated that they provide information about side effect when patient ask about them and also similar in this study patient got less information and physician more restricted to provide information to patients about side effect of medications(Auyeung et al., 2011),one the reason behind this pharmacist and physician stated that patients maybe discontinue on their medication if we give them more detail about potential side effect(Olson & Windish, 2010).

5.1 Strength and limitations:

The respond rate was high and we had wide range demographic characteristic, generally patients satisfied with questioner that we asked them and more patients were available for obtaining data for our study.

About limitation our exclusion criteria were more and patients beside diabetic disease they didn't know to describe their other chronic disease which they had, also challenging in excluding the new diagnosed patient with diabetic, another limitations in this study we conducted in two center so risk of bias maybe. About HCP, s another major limitations were huge different between physicians and pharmacists who participated in our study.

5.2 Conclusion:

In this study patient adherence to antidiabetic medications was suboptimal, this was highly affected by sociodemographic characters of the patients such as gender, age, educational level and body mass index. Hba1c of non adherent Patients were higher compared to adherent patients. Fasting blood glucose level of none adherent patients were higher, indicating that better adherence leads to better diabetic control. About self-care activity, patients had less physical activity, less monitoring blood glucose level, less diet plan and less checking and drying their foot. According to patient satisfaction, patients were more satisfied with indication and usage of their medications comparing to potential side effect, patients stated that they got information from both doctors and pharmacists. Physicians and pharmacists together are responsible for providing information to patients. According to providing information of antidiabetic medications to patients, generally pharmacists and physicians didn't give enough counseling to patients.

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Appendices

The survey used.

The survey for patients translated to Kurdish by bilingual who are expert in English and Kurdish language

Appendix I

Socio-Demographical Information

Gender	Male	Female		
Age group	31-40	41-50	51-60	above 61
Educational status	Illiterate	Primary education	Secondary education	Diploma or university degree
Social habits	smokers	Alcoholics	Both smokers and Alcoholics	None of them
height				
weight				
Duration of Diabetes	: <5 years	5-9 years	>9_<15 years	>15 years
Co-morbid condition:				
Employment status	Employed	Unemployed		
Community	Urban	Rural		

Blood parameters

Lab data	
Fasting blood sugar	
HbA1c	
Creatinine	
Triglyceride	
Cholesterol	

Appendix II

Morisky Medication Adherence Scale (MMAS)

، دەرمان	نەخۆش بە	پابەندبونى
	بەلى	نەخىر
هچ کائیک بووه دهرمان خواردن لهبیریکهی		
ئايه كەسنِكى كەمتەرخەمى لەكاتى خواردنى دەرمان واتە گرنگى بە كاتى خواردنى دەرمان نادەى		
کاتێِک ههست به باشبوون دهکهی ههندێِک جار واز له دهرمان خواردن دێنی		
هەندنیک جار که هەست به تەندروستی خراپ بوون دەکەی کاتیک دەرمانەکەت دەخۆی نایا واز له دەرمانەکە دەهیّنی		

	Yes	No
Do you ever forget to take your medicine?		
Are you careless at times about taking your medicine?		
When you feel better do you sometimes stop taking your medicine		
Sometimes you feel worse when you take the medicine: do you stop taking it?		

Appendix III Diabetic self-care activity tool

		پيوالمخالي چالاخي چاوديري خوود
7-5رۆژ	4-0رۆژ	له حەوت رۆژى رابردوو چەند رۆژ پابەندى بەرنامەى خۆراكىت بووى بۆ
		نەخۆشى شەكرەت؟
7-5رۆژ	4-0رۆژ	له حموت رۆژى رابردوو چەند رۆژ زياتر له پێنج جۆر سەوزەو ميوەت
		خواردوه؟
1< رۆژ	1-0رۆژ	له حموت رۆژى رابردوو جەند رۆژ خواردنى زۆر چەورى وەك گۆشت يان
		زۆر چەور كەلە بەر ھەمە شىريەكانن وەك كەرە ،قەيماخ ھند خواردووە ؟
1< رۆژ	1-0 رۆژ	له حموت رۆژى رابردوو جەند جار شيرنەمەنيت خواردوه؟
7-5رۆژ	4-0رۆژ	له حەوت رۆژى رابردوو جەند جار بەشدارىت كردوە لە چالاكيەكى وەرزشى
		به لاني کهم (۳۰ خوولهک)بنِت؟
بەلى	نەخێر	ئايا له سيّ مانگي ر ابردوو پشکنيني شهکر مت کردوه ؟
بەلى	نەخىر	رۆژانە دەرمانەكانت دەخۆى ؟
بەلى	نەخێر	نێوانی پەنجەكانت وشک دەكەيەرە پاش شوشتنيان ؟
بەلى	نەخێر	له حەوت رۆژى رابردوو جگەرەت كێشاوە گەر يەك قومىش بێت؟

How many of the last 7 days have you	0-4 days	5-7
followed the healthful eating plan?		days
On how many of the last 7 days did you	0-4 days	5-7
eat five or more servings of fruits and vegetables?		days
On how many of the last 7 days did you	0-1	>1 days
eat high-fat foods such as red meat or full-fat dairy products?	day	
On how many of the last 7 days did you	0-1	>1 days
have sweets?	day	
On how many of the past 7 days did you	0-4 days	5-7
participate in at least 30 min of physical		days
activity, including walking?		
Have you tested your blood sugar in past 3 months?	No	Yes
past 5 monuis:		
Do you take your prescribed	No	Yes
medications daily?		
Do you dry between your toes after	No	Yes
washing daily?		
Have you smoked a cigarette even one	No	Yes
puff during the past / days?		

Appendix IV

The Satisfaction with Information about Medicines Scale (SIMS)

	گەيشىتنى زانيارى بە نەخۆش		سەرچاوەي زانيپاريەكانى نەخۆش						
	دەزانم	کەمیّک دەزائم	نازانم	دكتۆر	دەرمانساز	دکتۆر وه دەرمانساز	كەسى تر	هيچيان	ر هز امهندی بهو ز انباریانه
ناوی دەرمانەكەت چيە؟									
دەرمەنەكەت بۆ چ نەخۆشىيەكە؟									
دەرمائەكەت چ كارێک دەكات ؟									
چۆن كار دەكات؟									
چەند كاتى دەوئ تا كار بكا؟									
چۆن پێمان دەلئى كە دەرمائەكەت كار دەكا؟									
پێؚويسته ماودى چەند لەسەر دەرمانەكەت بەردەوام يى؟									
چۆن دەرمانەكەت بە كاردېنى؟									
چۆن بتوانم دەرمانەكانم دە ستكەويّت؟									
زیانه لاوکیهکانی دەرمانهکه؟									
مەترسى زيانە لاوەكيەكان چين گەر لەمىەر جەستە دەربكەرى؟									
پڼويسته چې بکهي گهر زياني لاوهکې به دهربکهوي؟									
خواردنەوە كحوليەكان لە گەل دەرمانەكانت؟									
کارلئکی دەرمان لەگەل دەرمانی تر؟									
دەرمانەكا نت دە بېتە ھۆكارى خەوالويت؟									
کاریگاری دەرمانه کانت له سار جنست؟									
پنِویسته چی بکهی گهر ژەمنِکی دەرمان خواردنت بیربچی؟									

	Patients' perceiving knowledge			Patients' source of information					
	Knows	Partially knows	Dosart know	Doctor	pharmacist	Doctor and pharmacist	other	None	satisfying
What your medicine is called									
What your medicine is for									
What it does.									
How it works									
How long it will take to act.									
How you can tell if it is working									
How long you will need to be on your medicine									
How to use your medicine.									
How to get a further supply?									
Whether the medicine has any unwanted effects (side effect)									
What are the risks of you getting side effects?									
What you should do if you experience unwanted side effects									
Whether you can drink alcohol with your medicine?									
Whether the medicine interferes with other medicines									
Medications make you feel drowey?									
Whether the medication will affect your sex life?									
What you should do if you forget to take a dose									

Demographic data for HCPs

		Demographic o	lata of Re	espondents for HCPs				
Sex	Male		Female					
Age	24-30	31-40			41 and above			
Profession	Endocrinologist	Other do	Other doctors who prescribe diabetic medication					
	Pharmacist							
Years of experience	1-5	6-10		11-15	:	16-20	21 and above	

	Which one of them have responsibility to			How often do you describe this topics with your				
	disc	uss this topics? Freq	uency? (%)	Patients?				
	Doctor	pharmacist	both	Never	Rare	When asked	Offen	Always
What is your medicine called?								
What is each medicine for?								
What your medicine does?								
How does								
your medicine Works?								
How long will your medicine take								
to act?								
How can you tell if it is working?								
How long will you use your								
meancations?								
Do you know how to use your medicine?								
How to get a further supply?								
Whether the medicine has any unwanted effects?								
What are the risks of you getting side effects?								
What should you do if you experience an unwanted effects?								
Whether you can drink alcohol with your medicine?								
Whether the medicines interfere with other medicines								
Medications make you feel drowsy?								
Whether the medication will affect your sex life?								
What should you do if you forget to take a dose?								

CURRICULUM VITAE

Name	Rawen	Sumame	Abdullah
Place of birth	Iraq	Date of	3-5-1991
		birth	
Nationality	Iraq	Tel	009647504825837
Email	Roenabdulla2@gmail	com	

Education Level

	Name of the Institution where he/she was graduated	Graduation year
Postgraduate/ Specialization	-	-
Masters	NEU	2019
	Hawler medical university,	2015-2016
Undergraduate	college of pharmacy	
	Shaheed doctor	2010
High school	Abdulrehman	

Job experience

Duty	Institution	Duration (Year-Year)
Clinical Pharmacist	Haji Omaran Quality	2020-2021
	control	
Department	Rwandz Private	2016-2018
coordinator	Technical Institute	
	Isra pharmacy	2016-2017
Pharmacist		

Foreign Language	Reading Comprehension	Speaking	Writing
Arabic	Good	medium	bad
English	Very good	Very good	Very good

English	Very good	Very good	Very
			good
Kurdish	Native	Native	Native

Foreign Language Examination Grade								
YDS	ÜDS	IELTS	TOEFL IBT	TOEFL PBT	TOEFL CBT	FCE	CAE	CPE

	Math	Equally weighted	Non-math
ALES Grade			
Other grade			

Computer Knowledge

Program	Use proficiency
Microsoft office	Very good
PASW statistic	Very good