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

Blood Pressure Management in Diabetic Patients in Zakho, Iraq

By:

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MASTER

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

CLINICAL PHARMACY

2021 - NICOSIA

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Advisor
Prof. Dr. Bilgen Basgut

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DEDICATION

I would like to dedicate my work of this thesis to my family and friends who supported me from the beginning of this project to the end.

In dedication to my supervisor who helped me and provided excellent assist to me.

Prof. Dr. Bilgen Basgut

My special dedication goes to my advisor that has provided me excellent knowledge and education.

Assoc. Prof. Dr. Abdikarim Abdi

My dedication my advisor who unstoppably helped me from the beginning.

Dr. Meryem Deniz Aydın

I would like to dedicate my work on this thesis to m advisor that has incredibly helping me.

Assist. Prof. Dr. Nevzat Birand

APPROVAL PAGE

We certify that we have read the thesis submitted by Saeed Hassan Saeed Abdulraheem titled **"Blood Pressure Management in Diabetic Patients in Zakho, 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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ACKNOWLEDGEMENT

ABSTRACT

Abdulraheem, S.

Blood Pressure Management in Diabetic Patients in Zakho, Iraq

Background: Diabetes Mellitus and hypertension are among the most common chronic diseases worldwide. The prevailing side-by-side existence of hypertension and diabetes in popularity seems to be escalating due to the rising of populations' age and the development of hypertension and diabetes mellitus circumstances occurring with age.

Objective: To assess and determine the management of hypertension in diabetic patients considering good control of diabetes results improved supervision of hypertension.

Methods: This cross-sectional study was conducted at Chronic Disease Center in Zakho, Iraq near Zakho General Hospital to determine blood pressure parameters in diabetic patients. A total of 230 patients agreed to participated. Close-ended questions by the clinical pharmacist were asked to each patient and scored separately. Patients data such as medical history, duration of diabetes, medication adherence, and biochemical parameters were all obtained in this study.

Results: The study conducted in Zakho; Iraq illustrated that 178 (77.4%) participants were known to have good level of awareness whereas merely 10 (4.3%) participants had good level of attitude. The mean $\pm$ SD of age was (59.35 $\pm$ 8.548) of total participants. A statistically significant difference was demonstrated in this study among patients grouped as good level of awareness in comparison to participants with poor level of awareness (P-value<0.05). The study found that there was not statistically difference in comparing good and poor level of attitude.

Conclusion: Diabetes Mellitus and hypertension are among the foremost common constant maladies around the world. Early examinations of hypertension with life style alterations and advanced treatment of hypertension in diabetes may increment enhancements. The present study found awareness and attitude education in patients are vital programs to obtain the optimal results in the management of hypertension and diabetes. Further studies are necessary to achieve more comprehensive education regarding awareness and attitude of hypertensive patients specifically concurrent with diabetes.

Keywords: Diabetes Mellitus, Hypertension, Awareness, Attitude, HbA1c

DECLARATION

Hereby I declare that under no circumstances I had any unethical behavior in every step from the beginning to the end of this thesis. I accessed all information needed for this thesis according to academic ethical rules. Therefore, I had no influence in patient's rights nor did I reach any unethical approaches for this academic research.

Saeed Hassan Saeed Abdulraheem

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LIST OF ABBREVIATIONS

Abbreviations	Meaning
DM	Diabetes Mellitus
HT	Hypertension
BP	Blood Pressure
SBP	Systolic Blood Pressure
DBP	Diastolic Blood pressure
B.G	Blood Glucose
GLUT4	Glucose transporter type 4
AHA	The American Heart Association
ACC	The American College of Cardiology
NJC 7	The Seventh Report of the Joint National Committee
CD4	Cluster of differentiation 4
CD8	Cluster of differentiation 8
HLA	Human Leukocyte Antigen
T2DM	Type 2 Diabetes Mellitus
T1DM	Type 1 Diabetes Mellitus
PPAR	Peroxisome Proliferator-Activated Receptor
NEFA	Non Esterified Fatty Acid
GDM	Gestational Diabetes Mellitus
AACE/ACE	The American Association of Clinical Endocrinologists and The American College of Endocrinology
HbA	Hemoglobin A
HbA1c	glycated hemoglobin
ESRD	End-Stage Renal Diseases
VEGF	Vascular Endothelial Growth factor
BMI	Body Mass Index

IQR	Interquartile Range
SD	Standard Deviation
B.G	Random Blood Sugar
MTM	Medication Therapy Management
CDTM	Collaborative Drug Therapy Management
CMM	Comprehensive Medication Management
WHO	World Health Organization

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1. INTRODUCTION

Diabetes mellitus and hypertension occur together more regularly than other claimed morbidities in developing countries accounting up to 65% of existing simultaneously. It is reported that hypertension is about three times more occurring in diabetic patients. Type-2 diabetes mellitus (T2DM) appears to be furthermore common than type I diabetes and internationally, being responsible for approximately 90% of diabetic cases. The predicted diabetic prevalence is 2.8% and 4.4% in 2000 and 2030 including all ages (Venugopal and Mohammed, 2014). Ongoing investigations demonstrate that nearly 74% of diabetics who are adults have systolic blood pressure (SBP) of almost 140 mmHg or diastolic blood pressure (DBP) of roughly 90 mmHg or on the of prescribed medication for high blood pressure (BP) (Passarella et al., 2018). High blood pressure in type 2 diabetes has an unfavorable influence on the velocity of appearance and complexes of the disease for example retinopathy and nephropathy. Diabetes mellitus is a highly occurring disease, taking into account a population with more than 100 million people worldwide affected, which correlates to nearly 2.1% of humanity. T2DM is the most common disease, happening almost 10-20 times more regularly than T1DM. The World Health Organization estimates more than 5% of the world will be affected by diabetes by the year of 2025. This thesis helps to broaden and discover the current information regarding patient satisfaction, self-care, attitude, awareness, and economic status in Zakho, Duhok, Kurdistan Region, Iraq. it also demonstrates the correlation between several biomarkers such as HbA1c, random blood sugar, as well as the relationship between obesity, diabetes, hypertension. experiment with the hypothesis to determine any available interrelationship between Levels of Awareness and Attitude with obesity, glycated hemoglobin and hypertension.

2. BACKGROUND

2.1 Hypertension

Hypertension is a large factor of occurrence due to DM, that includes cerebrovascular, chronic renal disease, peripheral artery diseases, cardiac failure and even death (Colosia et al., 2013). A significant decline in microvascular and cardiovascular morbidity and mortality is achieved by BP decreasing (Tsimihodimos et al., 2018). Early recognition of prediabetes and prehypertension allows for further delaying the progressing of the diseases. The American Heart Association (AHA), the American College of Cardiology (ACC) and a variety of other professional societies issued joint guidelines for HT management in 2017. The said guidelines suggest starting antihypertensive medications in those with diabetes at a blood pressure of ≥130/80 mmHg with the purpose of < 130/80 mmHg. (Passarella *et al.,* 2018, Kabakov *et al.,* 2006). The intentions of AHA / ACC guidelines for decreasing Blood Pressure to lower than 130/80 mmHg for diabetic patients is established on the theory that diabetic patients are at higher risk of the cardiovascular system and based upon the outcome of two meta-analysis investigations that determined a superior decrease in the cardiovascular and microvascular incident as long as the SBP is managed under 130 mmHg (Lv *et al.,* 2013, Xie *et al.,* 2016). The Seventh Report of the Joint National Committee (NJC 7) on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure has reformulated normal BP with lower than 120/80 mmHg and formed a new category "Prehypertension" which includes the SBP range of 120 to 139 mmHg and DBP of 80 to 89 mmHg. The new "prehypertension" category was formed to determine those who might be at risk for getting hypertension and to notify health care professionals of early intervention and considerations. (Miller III and Jehn, 2004).

2.2 Management of hypertension

Many primary guidelines suggest diagnosis of hypertension when SBP is 140 mmHg or greater, or DBP is 90 mmHg or greater on recurring observation. The SBP is specifically critical in diagnosing hypertension in most patients. Hypertensive patients with diabetes should be considered to have blood pressure lower than 140/90 mmHg. Medication treatment shall be initiated in patients when nonpharmacologic and lifestyle alterations had not been influential. Majority of patients usually need more than 1 antihypertensive agents to accomplish effective management of hypertension. The general approach to managing hypertension includes increasing

medication dose or addition of new drugs roughly 3-week intervals. This method can be accelerated or delayed based on the observation by the physician. The starting dosage selected ought to be half of the maximum dosage. Various number of factors affect the choice of which medications to be initiated including race, ethnicity, age, medical conditions (e.g., diabetes, coronary artery disease, chronic kidney disease, etc.) related with hypertension and pregnancy which also affect the drug of choice for initiating management of hypertension. Guidance of hypertension medication selection are explained in (Table 1) for primary hypertension and medical conditions relevant to patient's blood pressure.

Table 1: Selection of Antihypertensive Agents with or without Medical Conditions

A: Treatment management when hypertension is primary			
	First medication	Second medication	Third medication
African origin	Calcium channel blocker[a] or thiazide	ARB[b] or ACEI	CCB + ACEI or ARB + Thiazide
White and non-black patients	ARB[b] or ACEI	Calcium channel blocker[a] or thiazide	CCB + ACEI or ARB +Thiazide
B: Treatment management when hypertension is present with other conditions			
Hypertension with diabetes	ARB or ACEI Note: calcium channel blocker or thiazide may be initiated in black patients	Calcium channel blocker or thiazide diuretic Note: ARB or ACEI to be added in black patients, if initiated with CCB or thiazide	Add Other substitute drug (Thiazide or calcium channel blocker)
Hypertension with chronic kidney disease	ARB or ACEI	Calcium channel blocker or thiazide[c]	Calcium channel blocker or thiazide (alternatives)

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; BP, blood pressure; CCB, calcium channel blocker; eGFR, estimated glomerular filtration rate.
[a] CCBs are typically selected however thiazides may be cost saving.
[b] ARBs may be used due to no coughing side effects.
[c] furosemide may be used if eGFR is less than 40 ml/min.

2.3 Pharmacist Role in Management of Hypertension and Diabetes Mellitus

Pharmacists provide important roles in healthcare profession for instance medication information, interviews with patients, minimize medication side effects, drug adherence, awareness and knowledge to patients. Face-to-face consultations and direct patient care are important aspects that a pharmacist being interactive and skilled to provide. In primary care settings, patient visiting by a pharmacist is typically 30-60 min. However, in primary care units with physicians a visit is approximately 15 min. Patient involvement planning directed on hypertension has shown that advice given by pharmacists for BP treatment resulted in effective correlation with patient awareness in comparison to patients reported of physician advice. The period of time that pharmacists tend to devote with patients, also with regular observations and follow-up of patients may contribute to beneficial outcomes for complicated cases and promote to narrowing the gap in healthcare. The decisive medication treatment by pharmacists especially with the capability to adjust therapy, or prescribe, depends by state. The agreement for medication therapy management (MTM) is an assistance or variety of services that enhance medication outcomes for patients. Services consist of pharmacotherapy examination, immunizations, medication therapy evaluation, and wellbeing programs. The Centers for Medicare and Medicaid Services require Medicare Part D plans to announce MTM is beneficial to qualified providers and specially recognizes pharmacists as suitable healthcare professionals to distribute MTM. Collaborative Drug Therapy Management (CDTM), is permissible in 48 states and is well-established in management of hypertension, diabetes mellitus, as well as heart failure. Comprehensive medication management (CMM) is an advanced system for clinical pharmacists which is an arrangement between a pharmacist and a physician that enables pharmacists to start, adjust or cease a medication therapy. Team-based interventions includes healthcare professionals such as physicians, nurses, pharmacists, nutritionists and social workers to deliver optimal care. A study organized by (Fortuna, R. J., Nagel, A. K., Rose, E., McCann, R., Teeters, J. C., Quigley, D. D & Rocco, T. A. (2015)). included as an approach to team-based methods. Physicians and nurses first finished an educational stage via practicing course to enhance awareness of suggestions and establish a standardized method to BP measurement. Clinical pharmacy interventions were completed simultaneously. The pharmacist segment consisted patient awareness and methods to boost adherence, for example pill box usage and auto pharmacy refresh, additionally, to deliver sessions to better medication treatment. In the course of 4-year study, 13404 participants with hypertension

data were recorded. The team-based intervention results suggested nearly 30% enhancement of BP control.

2.4 Diabetes Mellitus

2.4.1 Type I Diabetes Mellitus

Also called insulin-dependent diabetes is known as a disorder of autoimmune diseases that associates with the damage of the β-cells triggered via CD4 and CD8 T cells as well as macrophages around islets of the pancreas. Type I diabetes generally develop during childhood usually in those with less than 35 years of age. Genetic researches have explained that the gene HLA (human Leucocyte antigen) found on chromosome 6 is conjugately related to type I diabetes. On cell surfaces there lies these proteins which assist in immunity to differentiate normal cells versus other external agents. The autoimmune reaction responds to the β-cells due to any irregularities that might occur in the HLA proteins.

Another form of Type 1 Diabetes is uncommon and usually seen in African and Asian patients. It is not related to autoimmunity however it a deficiency of insulin production and is sensitive to ketoacidosis due to lack of β-cells antibodies.

2.4.2 Type 2 Diabetes Mellitus

Type 2 Diabetes Mellitus is described as insulin resistance, inadequate production of insulin and insulin release. It is usually discovered later in life and is responsible for 90% of the diabetes worldwide. This type of diabetes is split into two groups, with and without obesity. Type 2 Diabetes with obesity occurs as a result of resistance to insulin because of changes in receptors found in cells. Although, Type 2 Diabetes without obesity is associated with resistance and lack of produced insulin and its secretion. Many mechanisms have been suggested, in addition to arisen non-esterified fatty acids, adipokines, mitochondrial malfunction for insulin resistance and inflammatory cytokines as well as lipotoxicity, glucotoxicity and formation of amyloid for β cell. Genetics play an important role in this disease, however only several genes have been found out which include, genes for potassium inward-rectifier 6·2, insulin receptor substrate-1, peroxisome proliferator-activated receptor (PPAR), and for calpain 10. T2DM treatment and management include a combo of antihyperlipidemic, antiplatelet and antihyperglycemic drugs as well as diet and exercise. (Stumvoll M., 2005)

2.4.2.1 Insulin Resistance

Insulin resistance is believed to be demonstrated when the normal impacts of insulin are lower for depositing glucose in skeletal muscle and inhibition of endogenous glucose formation especially found in the liver. During the fasting condition, muscle counts for a limited portion of glucose (smaller than 20%). Although, endogenous glucose accounts for the rest of glucose arriving into the plasma. Endogenously found glucose is quickly increased in T2DM or dysfunctional fasting glucose. During the early stages of this disease, it occurs with the existence of hyperinsulinemia. Hepatic insulin insensitivity is the main cause of behind T2DM. (Stumvoll M., 2005)

2.4.2.1 Obesity

Physical inactivity and obesity are greatly related to resulting in insulin insensitivity. A few mechanisms have been discovered to explain this interaction. Hormones found circulating in the blood, metabolic fuels for example non-esterified free fatty acids emerging from adipocyte and stimulate insulin function. An elevated of triglyceride found in deep subcutaneous adipose depots contributes to adipocytes which are insensitive to the capability of insulin to inhibit lipolysis. This causes high amount of discharge and circulating of glycerol and NEFA leading to exacerbate insulin insensitivity in skeletal muscle and liver. increased amount of Fat storage found in adipocytes as well as in non-adipose cells plays an important role too. for instance, an excessive amount of intramyocellular lipids are linked with skeletal muscle insulin insensitivity. (Stumvoll M., 2005)

2.4.3 Gestational Diabetes Mellitus (GDM)

GDM is defined as the development of diabetes during pregnancy and the ending of it later in the pregnancy period. This is explained as the secretion of insulin by the placenta is boosted and increased insulin resistance at later stages of the first trimester. This type of diabetes is usually resolved at the end of the gestational period. However, a few complications may happen and could be permanent. For instance, the death of mother and fetus is noticeably increased with GDM. Nephropathy can cause pre-eclampsia that results in various abnormalities in developing fetuses, for example, premature delivery and stillbirth and), premature delivery and stillbirth.

2.5 Glycosylated HbA1c

According to the American Association of Clinical Endocrinologists and the American College of Endocrinology (AACE/ACE), HbA1c lower than 6.5 is advised for diabetic patients. (Keresztes & Peacock-Johnson, 2019). In the process of proteins, they are regularly glycated during favorable physiological conditions. Despite, hemoglobin, a nonenzymatic reaction occurs between the N-terminal and the glucose of the β-chain, forming a Schiff base. during this process, Amadori products are formed by the base, also known as HbA1c. In the initial step of forming glycated hemoglobin, blood glucose and hemoglobin cooperate to produce aldimine in a reversible reaction. In the later irreversible step, a stable ketamine form is produced by the conversion of aldimine. The large sites of glycosylating hemoglobin, in the arrangement of popularity, are β-Val-1, β-Lys-66, and α-Lys-61. Normal adult hemoglobin consists predominantly of HbA (α 2β2), HbA2 (α 2δ2), and HbF (α 2γ 2) in the composition of 97%, 2.5%, and 0.5%. Roughly 6% of HbA is made up of HbA1c that is actually consisted of HbA1a1, HbA1a2, HbA1b, and HbA1c fragments, described by chromatographic and electrophoretic properties, respectively. HbA1c is the most critical parameter in health being made up 5% of the total HbA fragments. Over two to three months prior, HbA1c is utilized to predict the blood glucose in the plasma since with the average plasma glucose escalates, the volume of plasma glycated hemoglobin in the plasma follows and increases. (Sherwani, Khan, Masood, Ekhzaimy, & Sakharkar, 2016)

2.6 Diagnostic Criteria

In diabetes, usually the amount of blood sugar is more than the normal range. Diagnostic method is based on testing blood glucose at distinguished times shown below:

1. Random plasma glucose ~ 200 mg/dL (11.1 mmnol/L)(12)
2. Fasting plasma glucose ~ 126 mg/dL (7 mmoI/L)(l2,13)
3. Oral glucose tolerance test (measure of plasma glucose levels 2 hr after glucose is given orally >200 mg/dL (11.1 mmol/L) (12)

Reference Ranges for normal HbA1c: 4.2-6.2%

The range for Diabetes Mellitus:

Good control < 6.8 %,

Moderate control 6.8-7.6 %

Poor control >7.6 %

The ACC/AHA recommendations of grouping blood pressure estimations

Normal BP: < 120/80 mm Hg;

Elevated BP: Systolic from 120-129mm Hg and diastolic less than 80 mm Hg

Stage 1 HT: Systolic between 130-139 mm Hg or 80-89 mm Hg in diastolic

Stage 2 HT: At least 140 mm Hg systolic, or at least 90 mm Hg diastolic

Hypertensive crisis: Systolic over 180 mm Hg and/or diastolic over 120 mm Hg

T1DM symptoms consist of polyphagia, polyuria and a high affinity to drink. Also, T2DM symptoms include stinging in the hands or feet, common infections in the skin, vagina and bladder. As well as disturbances, dimmed vision and delayed healing processes.

2.7 Diabetic complications

2.7.1 Diabetic Ketoacidosis

An important acute complication is a diabetic ketoacidosis; which is primarily seen in T1DM. In DKA, gluconeogenesis, glycogenolysis and ketone body formation in the liver are promoted by decreased insulin secretion and the excess amount of glucagon release (Tripathi, B. K., 2006).

2.7.2 Diabetic Retinopathy

Approximately half of the diabetic patients have some intensity of neuropathy, including the lack of peripheral sensitivity while connected with the abnormal microvascular and macrovascular terminal in the periphery, which can promote to non-healable ulcers, the main reason for amputation in diabetes, that is considered polyneuropathy whereas mono-neuropathy is less frequent and consists of malfunctioning of isolated cranial or peripheral nerves. Lastly, autonomic neuropathy is associated with numerous systems such as cardiovascular, genitourinary, gastrointestinal, metabolic and sudomotor systems (Tripathi, B. K., 2006).

2.7.3 Diabetic-Related Infections

Diabetic patients are reportedly greater at recurrence and severity of infection. Unnatural cell-mediated immunity as well as phagocyte actions related to hyperglycemia might explain the reason. Several uncommon infections are relatively solely seen in the diabetic population such as malignant otitis externa and rhino-cerebral mucormycosis. Diabetic patients are at higher risk of *S. aureus* in skin folds of the colon. Additionally, diabetic populations are more opportunistic to wound infections post-operations. (Tripathi, B. K., 2006)

2.7.4 Diabetic Nephropathy

Diabetic nephropathy is one of the main causes of end-stage renal diseases (ESRD). Glomerular hyperfiltration is caused by abnormalities in glomerular hemodynamics, promoting to glomerular destruction demonstrated by microalbuminuria. The presence of proteinuria, diminished the glomerular filtration rate, and renal failure. Malfunction of the glomerular filtration is indicated by microalbuminuria and is associated alterations alterations in synthesis and catabolism of numerous glomerular macromolecules in the basement membrane for example, proteoglycans and collagen, developing glomerular basement thickness. Plus, a different system is observed to demonstrate the enhancement in glomerulus permeability, which is the increase in renal VEGF stages indicated in diabetic models. (Tripathi, B. K., 2006)

3. METHOD

3.1 Study Design and Setting

This cross-sectional study was conducted at Chronic Disease Center in Zakho, Iraq near Zakho General Hospital housing around 200 beds between January 2021 to April 2021. There were 2 laboratory biochemists, 2 nurses and 2 physicians servicing patients simultaneously in separate offices. A clinical pharmacy researcher was working three hours per day from Sunday to Wednesday in an independent room.

3.2 Inclusion Criteria

Inclusion criteria included patients with age older than 30 years old, Patients with T2DM and those with T1DM. At least six months of diagnosed diabetes was required before participating in this thesis study.

3.3 Exclusion Criteria

Exclusion criteria included pregnant patients, patients with infections, patients who underwent surgery, malnutrition and patients with cognitive disabilities.

3.4 Materials

Beurer™ tensiomètre, BM70; Blood Pressure measurement device.

CareU™ Analyzer 100; Glycated hemoglobin measuring device.

CareU™ SMART; Blood glucose monitoring system.

Statistical Package for the Social Sciences (SPSS™ Statistics), Version 26.

3.5 Recruitment

The physicians were informed to consider diabetic patients who met the inclusion criteria to be sent to the clinical pharmacy researcher to be included in this study. The researcher verbally explained the process of this study and gave consent forms to individuals for participating in this study. Information such as name, age, sex, employment status, smoking status, family history, medication history and duration of diabetes were collected into the patient data collection form. (Appendix I). According to list of medication for each patient joined in this research, antihyperlipidemic agents indicated high cholesterol. Patients on anti-asthmatic agents labeled for

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having asthma. Participants that were receiving thyroid medications labeled for hyperthyroidism or hypothyroidism depending on medications, respectively. Based on participants that reported taking medications (such as gabapentin, pregabalin and/or carbamazepine) to be comprehended as one of the diabetes complications, neuropathy. Likewise, patients who reported eye related problems and ophthalmic appointments in the past were recorded as retinopathy.

3.6 Questionnaire Forms

A custom-made script was conducted for Awareness (Wang, Q., Zhang, X., Fang, L., Guan, Q., Guan, L., & Li, Q. (2018)) that consisted of 6 items (Appendix II). The measurement scale of each item of Awareness evaluated by "1" point for the appropriate answer and "0" for the false answer. The custom form was reviewed and validated by the panel of experts. The evaluation for each participant was measured with total answers reported equal or higher than 3 scores indicated good level of Awareness likewise total responses by participants lower than 3 scores was considered as poor level of Awareness. A specific script of the Diabetes Attitude Questionnaire (ATT-19) originally emerged from (Torres, H. C., Virginia, A. H., & Schall, V. T. (2005)) was developed for the purpose of this study (Appendix III). It consists of 10 items; each item was assessed with "1" point if the response of participants to that particular item was correct whereas the result would be "0" if the answer was "No". The sum of responses of participants in this study equal or higher than 5 scores was selected as good level of attitude meanwhile the total score less than 5 was known as poor level of attitude. The English versions of the questionnaire forms were translated to Kurdish and validated by a Kurdish linguistic expert for maximum comprehension. Re-translation from Kurdish to English was finalized. eventually, a comparison was performed on both completed translations to match the initial forms. Open-ended questions by the clinical pharmacist were asked to each patient. Each of the questions was assessed and scored separately. The form asks patients to recall their Awareness and Attitude of diabetes and hypertension diseases.

3.7 Blood sample collection

All participants had their blood withdrawn using CareU™ SMART, the conventional method for easy and non-invasive monitoring by utilizing a lancet on fingertip resulting in pricking to obtain 3mL of blood volume from capillaries for determination of random blood glucose. Additionally, the non-invasive technique for measuring glycosylated hemoglobin with CareU™ Analyzer 100

device, the blood sample is mixed and diluted with reaction reagent in the reagent 1 well. Red blood cells are hemolyzed by the surfactant. The released hemoglobin is aggregated and boronic acid conjugate binds to the glycated hemoglobin through cis-diols of the molecule. The reaction mixture is transferred to the membrane in the optical reading area. Wash buffer solution in the reagent 2 well is then delivered to the membrane in the optical reading area to wash out soluble components in the reaction mixture. Two optical sensors detect blue and red reflected lights from the optical reading area. The value of HBA1c is quantitatively measured by the ratio of glycated hemoglobin over the total hemoglobin. The test takes approximately 5 minutes per patient and is carried out by laboratory chemists.

3.8 Blood pressure measurement

Blood pressure measurement was performed on the left arm in sitting position on two consecutive attempts to minimize error and inaccuracy given 5 minutes rest in between. Beurer tensiomètre, the upper arm blood pressure monitoring device was utilized in this study.

3.9 Statistical Analysis

Data collected were coded and written into SPSS Software, version 26, IBM™ SPSS™ Statistics

The normal distribution analysis was carried out by determination of Kolomgorov-Smirnov test of normality, Shapiro-Wilk Test, Q-Q plots, recommended deciding this thesis's methods of statistical hypothesis. On the other hand, the descriptive samples were found by utilizing frequency and percentages. Including but not limited to Descriptive statistics for example Mean, Standard Deviation, Median, Interquartile Range, minimum and maximum values were described for continuous variables for instance Awareness, Attitude, and biomarkers such as HbA1c and B.G. additionally, blood pressure parameters such as systolic and diastolic were used as in continuous variables.

Mann-Whitney U test was carried out for independent continuous variables in comparison of level of Awareness and Attitude with HbA1c, Systolic, Diastolic, B.G, and diabetic complications.

Kruskal-Wallis Test was practiced for continuous variables for instance comparison between systolic and diastolic parameters among HbA1c Categories. Plus, Kruskal-Wallis Test was applied for the determination of Awareness and Attitude on BMI Status.

Post hoc Dunnett's T3 Test was utilized in determination of continuous variables such as HbA1c Group, Systolic and Diastolic blood pressure.

The relation of Awareness and Attitude levels, Diabetes complications, and patient's medical history was evaluated by applying the Chi-Square test and Fisher's Exact Test for calculations. The p-value of <0.05 was regarded as statistically significant.

3.10 Ethical Statement

Ethical approval for this thesis was approved and obtained by Research Ethics Committee in Duhok Directorates General of Health (Reference number: 10112021-11-3). Participants were given verbal and consent forms before to this study. This research was regulated with the Declaration of Helsinki, accordingly.

4. RESULTS

A total of 230 agreed to participate; 70 males and 160 females in the study. The study was conducted between January 2021 to April 2021. The most common co-morbidity was Hypertension (97%), followed by Hyperlipidemia (62.6%) and other diseases for instance, Asthma (1.7%), Rheumatism (3%) and Hypothyroidism (1.7%).

4.1 Patients Demographic Characteristics

Of 230 patients who agreed on participation in this thesis study, (30.4%) were male and (69.6%) were female. The mean ± SD of age was 59.35 ± 8.548 with 31 (13.5%) being older than 70 years old. The educational level was distributed being, Illiterate 171 (74.3%), Primary School 31 (13.5%), High School 16 (7%), and Institute/University 12 (5.2%). Employment was found only 13 (5.7%) versus 217 (94.3%) unemployed. Regarding BMI, 42 (18.3%) were found normal, 125 (54.3%) were Overweight, and 63 (27.4%) were Obese. Family History was seen in 128 (55.7%) patients. Smoking status was positive in 16 (7%) patients whereas, 214 (93%) patients were non-smokers.

Table 2: Patients Demographic Characteristics

	N	%
Gender		
Male	70	30.4
Female	160	69.6
Education Level		
Illiterate	171	74.3
Primary School	31	13.5
High School	16	7.0
Institute/University	12	5.2
Employment		
No	217	94.3
Yes	13	5.7
Age Group		
30-39	4	1.7

40-49	19	8.3
50-59	98	42.6
60-69	78	33.9
70 And more	31	13.5
BMI Classification		
Normal	42	18.3
Overweight	125	54.3
Obese	63	27.4
Duration of Diabetes (Years)		
1-4	48	20.9
5-9	70	30.4
10-14	60	26.1
15 and more	52	22.6
Family History		
No	102	44.3
Yes	128	55.7
Smoking Status		
No	214	93.0
Yes	16	7.0

This study demonstrated diabetic-related complications in Neuropathy in 112 (48.7%) patients, Retinopathy in 36 (15.7%), and Nephropathy in only 4 (1.7%) patients. (Table 2)

Table 3: Patients Diabetic-related Complications

	N	%*
Neuropathy	112	48.7
Retinopathy	36	15.7
Nephropathy	4	1.7

*The sum of percentage does not equal to 100. More than one complication is possible.

Medical history of the participants demonstrates the distribution of comorbidities such as Hyperlipidemia 144 (62.6%), Hypothyroidism 7 (2%), Hyperthyroidism 1 (0.4%), Rheumatism 5 (2.2%), and Asthma 4 (1.7%). (Table 3)

Table 4: Patients Medical History

	N	%*
Hyperlipidemia	144	62.6
Hypothyroidism	7	3.0
Hyperthyroidism	1	0.4
Rheumatism	5	2.2
Asthma	4	1.7

*The sum of percentage does not equal to 100. More than one disease is possible.

4.2 Patients Awareness Scale

The data demonstrated that 178 (77.4%) patients were considered having poor level of Awareness meanwhile 52 (22.6%) were selected as Good Level of Awareness. The mean $\pm$ SD for patients age who were known as Good Level of Awareness was (59 $\pm$ 8.60) was not significantly different from those who had Poor Level of Awareness (59.28 $\pm$ 8.46) because (p >0.05). In this study, more female patients were included (160, 69.6%), while the number male participants were (70, 30.4%). Considering BMI categories, Normal (42, 18.3%), Overweight (125, 54.3%), and Obese (63, 27.4%) no significance was found in BMI categories because (P-value >0.05). Educational level among participants was Illiterate (171, 74.3%), Primary School (31, 13.5%), High School (16, 7%), and Institute/University (12, 5.2%) with no statistically significance (p >0.05).
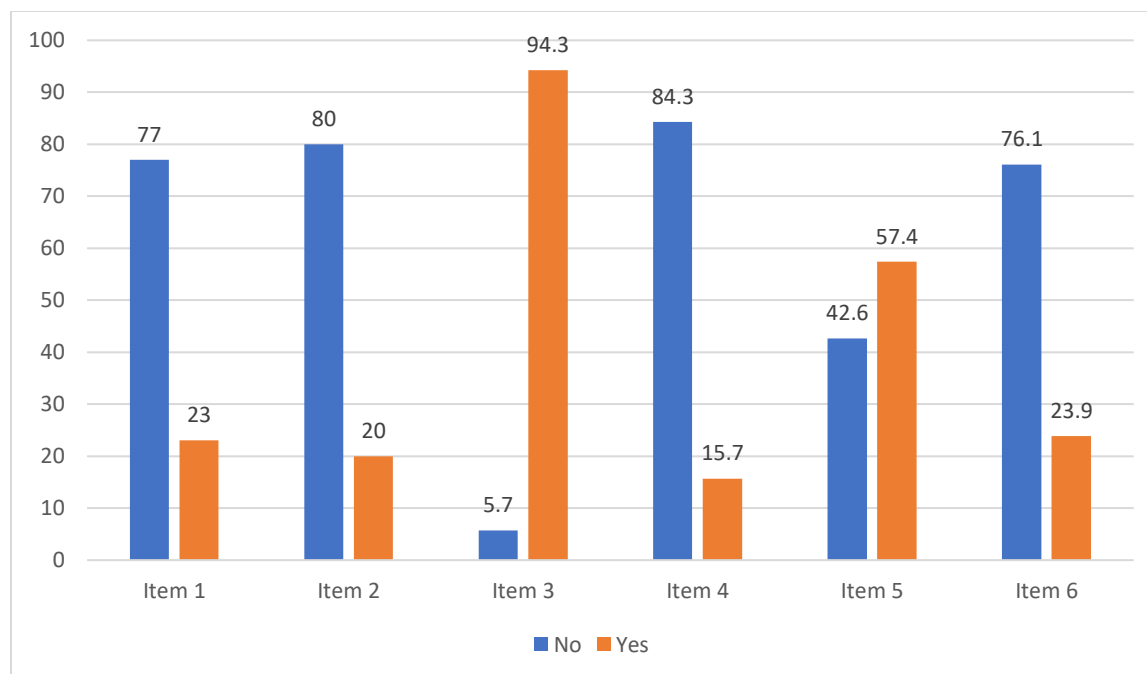
Figure 1: The percentage of Awareness of the respondents

Table 5: Awareness and Patients Demographic Characteristics

	Good level of awareness N (%)	Poor level of awareness N (%)	P-value
Gender			
Male	19 (36.5)	51 (28.7)	P > 0.05
Female	33 (63.5)	127 (71.3)	Pearson-Chi Square
Age			
30-39	2 (3.8)	2 (1.1)	
40-49	2 (3.8)	17 (9.6)	
50-59	22 (42.3)	76 (42.7)	P > 0.05
60-69	19 (36.5)	59 (33.1)	Fisher's Exact Test
70 and older	7 (13.5)	24 (13.5)	
BMI Classification			
Normal	17 (32.7)	25 (14.0)	P > 0.05
Overweight	17 (32.7)	108 (60.7)	

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Obese	18 (34.6)	45 (25.3)	
Education			
Illiterate	39 (75)	132 (74.2)	
Primary School	4 (7.7)	27 (15.2)	P > 0.05
High School	7 (13.5)	9 (5.1)	Fisher's Exact Test
Institute/University	12 (5.2)	10 5.6)	

4.3 Correlation Between HbA1c, B.G and Awareness Scale

The HbA1c mean ± SD of patients selected as Good Level of Awareness was 7.752 ± 0.923 with median, minimum, maximum IQR; 7.5, 6.4, 10.3, 1.1 reached a statistically significant reduction compared to Poor Level of Awareness patients at 8.727 ± 0.923 with median, minimum, maximum and IQR of 8.45, 5.7, 13.1, and 1.7, that is a statistically significant difference because (p-value <0.05). The mean and Standard deviation of R.B.G for Good Level of Awareness patients 162.58 ± 29.165 with median, minimum, maximum, IQR of 154.0, 115, 246, 42 that is a significant reduction from Poor Level of Awareness patients 187.49 ± 49.22 with median, minimum, maximum and interquartile range of 174.50, 101, 351, 62 because of (p-value < 0.05).

Table 6: Correlation Between HbA1c, B.G and Awareness Scale

	Poor level of Awareness*	**Good level of Awareness***
HbA1c	8.45 (1.7)	7.5 (1.1)
R. B. G	174 (62)	154 (42)

- Values are expressed in Median (IQR)

4.4 Correlation Between Systolic, Diastolic and Awareness Scale

Participants in this study had a mean and standard deviation of Systolic and diastolic parameters of (149.23 ± 21.20, 92.49 ± 61.04) respectively. The median of systolic and diastolic parameters of patients chosen as Good level of Awareness followed as 140.5, 90.5 with IQR 25, 21 respectively. The study found there was a statistically significant difference of systolic parameter from Poor level of Awareness patients with the median (IQR) of 150 (31) of systolic. However, no significant difference of diastolic parameter with the median (IQR) of 90.5 (17) was determined because of (p-value >0.05).

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Table 7: Correlation Between Awareness and Blood Pressure Parameters

	Poor level of Awareness	**Good level of Awareness**	**P value**
Systolic	150 (31)	140.5 (25)	P <0.05
Diastolic	90.5 (17)	90.5 (21)	P >0.05

values are presented as Median and (IQR)

4.5 Correlation Between Diabetic Complications and Awareness Scale

The study revealed that Neuropathy had no statistically significant difference in Good level of Awareness patients (10%) versus Poor level of Awareness patients (38.7%) with (p value > 0.05) using Pearson Chi-Square. Retinopathy and Nephropathy also did not reach a statistically significant difference in Good level of Awareness patients with comparison to Poor level of Awareness patients both with (p value >0.05) (Table 11).

Table 8: Correlation Between Diabetic Complications and Awareness Scale

	Neuropathy	Retinopathy	Nephropathy
Poor level of Awareness	89 (38.7%)	31 (3.5%)	4 (1.7%)
Good level of Awareness	23 (10%)	5 (2.2%)	0 (0%)

The study showed a total of (64%) Polypharmacy and (36%) No Polypharmacy. More patients considered to be the Polypharmacy group (69%) female patients and (31%) male patients. Meanwhile, No Polypharmacy was found approximately (70% & 30%) for male and female patients. The average of patients with polypharmacy showed the mean of 4.1 with SD (± 1.44). This study found a significantly high percentage of Polypharmacy between the age of 60 to 69 with (p<0.05). The median of glycated hemoglobin of Polypharmacy and No Polypharmacy (8.2% & 8.3%) that did not reach a statistical significance because of (p >0.05).

Common side effects reported by the patients included headache and dizziness followed by tachycardia and stomach upset.

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Table 9: Patient Perceived Awareness and Percentage of Responses to Each Item

Survey Questions	Yes N (%)	No N (%)
1. Do you understand what an increased A1C means?	53 (23)	177 (77)
2. Do you know the goal of A1C level we are trying to achieve?	46 (20)	184 (80)
3. Did your physician give information on your antihyperglycemic medications?	217 (94.3)	13 (5.7)
4. Do you know what your blood pressure should be coexisting with diabetes?	36 (15.7)	194 (84.3)
5. Do you know your recent blood pressure?	132 (57.4)	98 (42.6)
6. Do you have Information about your blood pressure?	55 (23.9)	175 (76.1)

4.6 Patients Attitude Scale

In this study, 220 (95.7%) participants were declared to have Poor level of Attitude and only 10 (4.3%) as Good level of Attitude. The mean ± SD of age for patients who have good level of Attitude was (54.60 ± 8.35) while participants with poor level of Attitude had the mean and standard deviation of (59.56 ± 8.51) which determines that the age of good level of attitude patients was not significantly lower than Poor level of Attitude participants because (p >0.05). The number of female patients was more (160, 70%) at the same time male patients were only (70, 30%). BMI Categories for Poor level of Attitude include Normal (39, 17%), Overweight (121, 52.6%), and Obese (60, 26.1%). The difference between BMI categories among Poor and Good level of awareness was insignificant because (p-value >0.05). The educational level for Poor level of Attitude consists of Illiterate (163, 70.9%), Primary School (30, 13%), High School (15, 6.5%) and lastly Institute/University (12, 5.2%) with (p >0.05) no significant differences were found between educational level and Attitude Scales among participants.
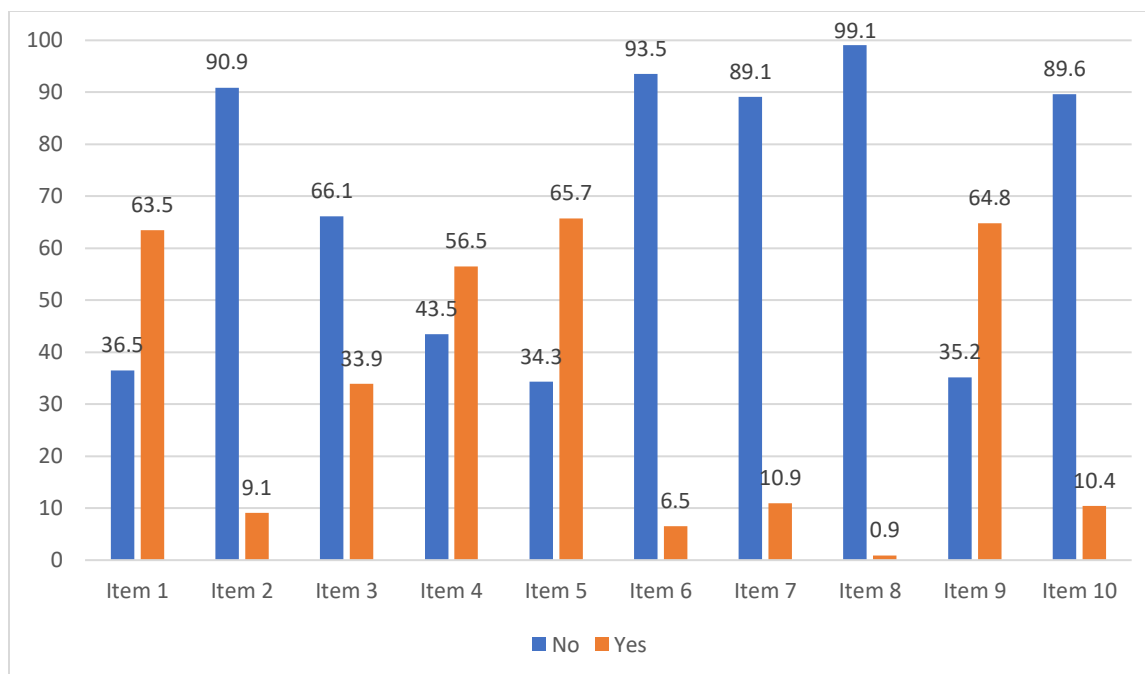
Figure 2: The percentage of Attitude of the respondents

Table 10: Attitude and Patients Demographic Characteristics

	Poor level of Attitude N (%)	Good level of Attitude N (%)	P-value
Gender			
Male	68 (29.6)	2 (0.9)	P > 0.05
Female	152 (66.1)	8 (3.5)	
Age			
30-39	3 (1.3)	1 (0.4)	
40-49	17 (7.4)	2 (0.9)	
50-59	94 (40.9)	4 (1.7)	P > 0.05
60-69	75 (32.6)	3 (1.3)	
70 and older	31 (13.5)	0 (0.0)	
BMI Classification			
Normal	39 (17)	3 (1.3)	P > 0.05
Overweight	121 (52.6)	4 (1.7)	

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Obese	60 (26.1)	3 (1.3)	
Education			
Illiterate	163 (70.9)	8 (3.5)	P >0.05
Primary School	30 (13)	1 (0.4)	
High School	15 (6.5)	1 (0.4)	
Institute/University	12 (5.2)	0 (0.0)	

4.6 Correlation Between HbA1c, B.G and Attitude Scale

The study discovered HbA1c and B.G for participants Attitude. The glycated hemoglobin median (IQR) for participants with Good level of Attitude was 7.25 (1.5) which was not statistically significant from Poor level of Attitude participants 8.3 (1.8) because (P-value >0.05). The current study also revealed the median (IQR) of B.G for participants selected as Good level of Awareness 168 (62). There was no statistically significant difference from those who had Poor level of Attitude with the median (IQR) of 171 (55) since (P-value >0.05).

Table 11: Correlation Between HbA1c, B.G and Attitude Scale

	Poor level of Attitude*	Good level of Attitude*	P value
HbA1c	8.3 (1.8)	7.25 (1.5)	P >0.05
B.G	171 (55)	168 (62)	P >0.05

4.5 Correlation Between Systolic, Diastolic and Attitude Scale

The present study found the median (IQR) of systolic and diastolic parameters for participants who were selected for having poor level of attitude was 147 (30) and 90.5 (18) which were not statistically significant from participants with Good level of Attitude 141 (27) and 88 (23) because (p-value >0.05 for both parameters).

Table 12: Correlation Between Systolic, Diastolic and Attitude Scale

	Poor level of Attitude	Good level of Attitude	P value
Systolic	147 (30)	141 (27)	P >0.05
Diastolic	90.5 (18)	88 (23)	P >0.05

4.7 Correlation Between Diabetic Complications and Attitude Scale

The present study found there was no significant differences between attitude scales and diabetic complications.

Table 13: C Correlation Between Diabetic Complications and Attitude Scale

	Neuropathy	Retinopathy	Nephropathy
Poor level of Attitude	106 (48.2%)	35 (15.9%)	4 (1.8%)
Good level of Attitude	6 (60%)	1 (10%)	0 (0%)

Table 14: Patient Perceived Attitude and Percentage of Responses to Each Item

Survey Questions	Yes N (%)	No N (%)
1. Do you frequently monitor your blood glucose?	146 (63.5)	84 (36.5)
2. When you feel like your diabetes is under control, do you skip taking your medication?	21 (9.2)	209 (90.9)
3. Do you make your own modification in the dose of drugs prescribed?	78 (33.9)	152 (66.1)
4. Do you regularly check your blood pressure?	130 (56.5)	100 (43.5)
5. Do you always take your medication at the appropriate time?	151 (65.7)	79 (32.3)
6. The following medications (Advil, Volfast, Ibuprofen, Mobic, Naproxen) are often used for pain or arthritis. Do you take at least one of them when you have pain?	15 (6.5)	215 (93.5)

7. Do you ever miss doses of your medication on purpose?	205 (89.1)	25 (10.9)
8. During sick days (e.g., flu), do you skip taking your diabetic medicine without consulting your physician/pharmacist first?	2 (0.9)	228 (99.1)
9. Do you ever forget to take your medication?	81 (35.2)	149 (64.8)
10. Do you ever stop taking your medication when you are feeling worse?	24 (10.4)	206 (89.6)

4.8 Correlation Between HbA1c Categories and Systolic/Diastolic Parameters

The data revealed there was a statistically significant difference between HbA1c groups Good Control and Poor Control. With Good Control group resulting a statistically significant reduction of median 135 and IQR 25 whereas Moderate control and Poor Control had a median and IQR of 145.5 (37), 154 (31) with (p-value <0.05). However, no significant difference was found between Moderate control and Poor Control. Diastolic Blood Pressure, Good control with a median of 84 was statistically different from the Poor control group that has the median of 92 with (p-value >0.05).

Table 15: Correlation Between HbA1c Categories and Systolic/Diastolic Parameters

Blood Pressure	HbA1c Categories	Median (IQR)	P-Value
Systolic	Good control	135 (25)	P <0.05
	Moderate control	145.5 (37)	
	Poor control	154 (31)	
Diastolic	Good control	84 (21)	P <0.05
	Moderate control	89 (20)	
	Poor control	92 (16)	

4.9 Diabetic complications in patients

The major complication of diabetes reported in this study was neuropathy in 112 (48.7%) patients followed by retinopathy in 36 (15.7%) patients. Nephropathy was only reported in 4 (1.7%) of patients. The baseline of study will be essential for future researchers in Iraq.

4.10 Correlation Between Diabetic Complications and Duration of Diabetes

Neuropathy and nephropathy were found to be statistically insignificant with the duration of diabetes because p-values (0.143 and 0.908). However, retinopathy was found to occur significantly higher (50%) in 15 or more years of duration of diabetes.

Table 16: Correlation Between Diabetic Complications and Duration of Diabetes

	1-4 [a]	5-9 [a]	10 – 14 [a]	15 or more [a]
Neuropathy	20 (17.9%)	29 (25.9%)	32 (28.6%)	31 (27.7%)
Retinopathy	3 (8.3%)	3 (8.3%)	12 (33.3%)	18 (50.0%)
Nephropathy	0 (0.0%)	2 (50.0%)	1 (25.0%)	1 (25.0%)

[a] duration of diabetes is presented in years

4.11 Correlation Between Smoking Status, Systolic and Diastolic Blood Pressure

The present study showed the mean $\pm$ SD of age for smokers in this study was (60.70 ± 8.49). BMI categories of smokers include Normal (2, 0.9%), Overweight (61, 26.5%), Obese (24, 10.4%). The study established that there was a statistically significant difference of systolic blood pressure among smokers with a median (IQR) of 153 (36) with (P value <0.05). In comparison to participants who did not report to be smoking with systolic median (IQR) of 144 (25). No statistically significance was determined in diastolic blood pressure between smokers and non-smokers.

Table 17: Correlation Between Smoking Status, Systolic and Diastolic Blood Pressure

	Non-smokers*	Smokers*	P Value
Systolic	144.00 (25)	153.00 (36)	P <0.05
Diastolic	91 (18)	90 (17)	P >0.05

*Values are expressed as Median (IQR)

DISCUSSION

Diabetes and hypertension are the most prevalent chronic diseases that exist simultaneously. Studies have demonstrated that diabetes is related to the increased occurrence of hypertension mortality. Diabetic patients have higher chances of confronting cardiovascular complications. The occurrence of DM is promptly increasing and may influence almost 300 million people around the world whereas more than ½ of them will have hypertension. (Sampanis and Zamboulis, 2008).

The participants who agreed to join in this study were majority female patients (69.6%) in comparison to males (30.4%) with the mean ± SD of age was 59.35 ± 8.548 with 31 (13.5%) being older than 70 years old. comparable to this research, another study conducted had more female participants (60%) than male participants (40%) (Planas, L. G., Crosby, K. M., Mitchell, K. D., & Farmer, K. C., 2009). A study carried out in Brazil similar to this study structure had more female participants (64.6%) with an average age of 61.28 years (Rodrigues, F. F. L., 2009).

When considering BMI, it was found to have the mean ± SD of 28.23 ± 3.53, these outcomes demonstrate that most of the subjects were overweight and obese (54.3% and 27.4%, respectively). The finding of the present study is similar to another study carried out in Brazil that results suggested a large number of participants being either overweight or obese (Assunção, S. C., Fonseca, A. P., Silveira, M. F., Caldeira, A. P., & Pinho, L. D. (2017)). It is predicted that a large number of diabetic patients nearly 80% are obese or overweight (Feldstein, A. C., Nichols, G. A., Smith, D. H., Stevens, V. J., Bachman, K., Rosales, A. G., & Perrin, N. (2008).

The results of this conducted study suggest although participants who presented high level of awareness did not pose an excessive change in attitude to manage the diseases. This result is similar to another study established that revealed majority of participants presenting high level of awareness did not show any significant change towards their attitude (Rodrigues, F. F. L., Zanetti, M. L., Santos, M. A. D., Martins, T. A., Sousa, V. D., & Teixeira, C. R. D. S. (2009)).

Patients who scored high level of awareness were related with a positive diabetes family history with comparison to patients with a negative family history (57.7% vs 42.3%). This finding

is in accordance with another study found similar results that awareness had a statistically significant difference in patients with a positive family history (Niroomand, M., Ghasemi, S. N., Karimi-Sari, H., Kazempour-Ardebili, S., Amiri, P., & Khosravi, M. H. (2016).

The data found in the present study suggested (23.4%) of patients scored good level of awareness whereas only (4.3%) reported good attitude towards the disease. The present study is in agreement with Saadia et al. which was conducted in Saudi Arabia, the results suggested patients had better level of awareness and low level of attitude. The difference, Saadia et al. assessed only female participants in the study (Saadia, Z., Rushdi, S., Alsheha, M., Saeed, H., & Rajab, M. (2010)).

The study found a statistically significant difference between glycemic control in hypertensive patients. Blood pressure parameters (systolic/diastolic) were significantly reduced in good control in comparison to poor glycemic control (p<0.05). This outcome is consistent with another similar the study demonstrated that good control in diabetic HbA1c resulted in decreased blood pressure in Duhok, Iraq (RASOOL, SUZAN OMER, 2020). An RCT study has established a statistically significant decrease in both SBP and the DBP in intervention group (Jarab, A. S., Alqudah, 2012). An RCT research study revealed SBP resulted in a decrease of 9 months trial in the intervention group was found to be statistically significant (P = 0.003).

A high percentage of patients (63.5%) reported that they regularly screen their blood glucose. In comparison to earlier studies similar to this study design, a high percentage of respondents (>95%) gave feedback that they monitor their blood glucose frequently which was conducted in the Internal Medicine Department of a hospital in the United Arab Emirates (Arifulla, M., Lisha Jenny, 2014).

More female patients were found to be in the Polypharmacy group (64%) than male patients (36%). A previous study carried out in Saudi Arabia with a similar design has

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demonstrated nearly identical results by women being significantly higher percentage than men (81% vs 71%) with (p <0.05) (Alwhaibi, M., Balkhi, 2018).

STUDY LIMITATIONS

Limited sample size in collecting adequate precision and accuracy data for estimating the most prevalent chronic diseases. This cross-sectional study design may not be generalized to the Iraq's whole population. However, the data obtained in the present study will be essential for future awareness and attitude researches.

CONCLUSION

In this study, Diabetes Mellitus and hypertension are among the foremost common constant maladies around the world. Early examinations of hypertension with life style alterations and advanced treatment of hypertension in diabetes may possibly increment enhancements. The present study demonstrated that majority of participants (77.4%) were selected for having good level of Awareness and only a minority of patients (4.3%) were known to have good level of Attitude. Patients with optimal control of their long-term hemoglobin A1c resulted in improved hypertension management. Team-based programs are vital for complete medication adherence and minimize side effects for patients. Sufficient Awareness and Attitude in most underdeveloped countries is lacking. Thus, further research in diabetes hypertension management awareness and attitude is essential for better handling the diseases management.

REFERENCE

ACCORD Study Group. (2010). Effects of intensive blood-pressure control in type 2 diabetes mellitus. *New England Journal of Medicine*, *362*(17), 1575-1585.

Ahmed, S. A., Badi, S., Tahir, H., Ahmed, M. H., & Almobarak, A. O. (2019). Knowledge and practice of diabetic foot care in Sudan: A cross sectional survey. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *13*(4), 2431-2435.

Alwhaibi, M., Balkhi, B., Alhawassi, T. M., Alkofide, H., Alduhaim, N., Alabdulali, R., ... & Sambamoorthi, U. (2018). Polypharmacy among patients with diabetes: a cross-sectional retrospective study in a tertiary hospital in Saudi Arabia. *BMJ open*, *8*(5), e020852.

Bluml BM. Definition of medication therapy management: development of professionwide consensus. J Am Pharm Assoc 2005; 45:566–572.

Borba, A. K. D. O. T., Arruda, I. K. G., Marques, A. P. D. O., Leal, M. C. C., & Diniz, A. D. S. (2019). Knowledge and attitude about diabetes self-care of older adults in primary health care. *Ciencia & saude coletiva*, *24*, 125-136.

Britov, A. N., & Bystrova, M. M. (2003). New guidelines of the Joint National Committee (USA) on prevention, diagnosis and management of hypertension. From JNC VI to JNC VII. *Kardiologiia*, *43*(11), 93-97.

Colosia, A. D., Palencia, R., & Khan, S. (2013). Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: a systematic literature review. *Diabetes, metabolic syndrome and obesity: targets and therapy*, *6*, 327.

Duggirala, M. K., Cuddihy, R. M., Cuddihy, M. T., Naessens, J. M., Cha, S. S., Mandrekar, J. N., & Leibson, C. L. (2005). Predictors of blood pressure control in patients with diabetes and hypertension seen in primary care clinics. *American journal of hypertension*, *18*(6), 833-838.

Ferrannini, E., & Cushman, W. C. (2012). Diabetes and hypertension: the bad companions. *The Lancet*, *380*(9841), 601-610.

Fortuna RJ, Nagel AK, Rose E, et al. Effectiveness of a multidisciplinary intervention to improve hypertension control in an urban underserved practice. J Am Soc Hypertens 2015; 9:966–974.

Feldstein, A. C., Nichols, G. A., Smith, D. H., Stevens, V. J., Bachman, K., Rosales, A. G., & Perrin, N. (2008). Weight change in diabetes and glycemic and blood pressure control. *Diabetes care*, *31*(10), 1960-1965.

Greer N, Bolduc J, Geurkink E, et al. Pharmacist-led chronic disease management: a systematic review of effectiveness and harms compared with usual care. Ann Intern Med 2016; 165:30–40.

Jarab, A. S., Alqudah, S. G., Mukattash, T. L., Shattat, G., & Al-Qirim, T. (2012). Randomized controlled trial of clinical pharmacy management of patients with type 2 diabetes in an outpatient diabetes clinic in Jordan. *Journal of Managed Care Pharmacy*, *18*(7), 516-526.

Korcegez, E. I., Sancar, M., & Demirkan, K. (2017). Effect of a pharmacist-led program on improving outcomes in patients with type 2 diabetes mellitus from Northern Cyprus: a randomized controlled trial. *Journal of managed care & specialty pharmacy*, *23*(5), 573-582.

Maina, W. K., Ndegwa, Z. M., Njenga, E. W., & Muchemi, E. W. (2010). Knowledge, attitude and practices related to diabetes among community members in four provinces in Kenya: a cross-sectional study. *Pan African Medical Journal*, *7*(1).

Masnoon, N., Shakib, S., Kalisch-Ellett, L., & Caughey, G. E. (2017). What is polypharmacy? A systematic review of definitions. *BMC geriatrics*, *17*(1), 1-10.

Mc Namara KP, Versace VL, Marriott JL, Dunbar JA. Patient engagement strategies used for hypertension and their influence on self-management attributes. Fam Pract 2014; 31:437–444.

McKnight AG, Thomason AR. Pharmacists' advancing roles in drug and disease management: a review of states' legislation. J Am Pharm Assoc 2009; 49:554–558.

MILLER III, E. R. & JEHN, M. L. 2004. New high blood pressure guidelines create new at-risk classification: changes in blood pressure classification by JNC 7. Journal of Cardiovascular Nursing, 19, 367-371.

Nazar, C. M. J., Ahmed, A., Akhtar, M. H., & Kareem, N. (2016). The awareness levels, attitude and perception of people about diabetes. *J Renal Endocrinol*, *2*(1), e01.

O'Dwyer, M., Peklar, J., McCallion, P., McCarron, M., & Henman, M. C. (2016). Factors associated with polypharmacy and excessive polypharmacy in older people with intellectual disability differ from the general population: a cross-sectional observational nationwide study. *BMJ open*, *6*(4).

Oliveira, K. C. S. D., & Zanetti, M. L. (2011). Knowledge and attitudes of patients with diabetes mellitus in a primary health care system. *Revista da Escola de Enfermagem da USP*, *45*, 862-868.

Planas, L. G., Crosby, K. M., Mitchell, K. D., & Farmer, K. C. (2009). Evaluation of a hypertension medication therapy management program in patients with diabetes. *Journal of the American Pharmacists Association*, *49*(2), 164-170.

RASOOL, S. O. (2020). PREVALENCE OF HYPERTENSION ACCORDING TO NEW GUIDELINES IN PATIENTS WITH TYPE 2 DIABETES MELLITUS. *Journal of Duhok University*, *23*(2), 85-91.

Ribet, F. (2020). *Integrated microsystems for continuous glucose monitoring, interstitial fluid sampling and digital microfluidics* (Doctoral dissertation, KTH Royal Institute of Technology).

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Rodrigues, F. F. L., Zanetti, M. L., Santos, M. A. D., Martins, T. A., Sousa, V. D., & Teixeira, C. R. D. S. (2009). Knowledge and attitude: important components in diabetes education. *Revista latino-americana de enfermagem*, *17*, 468-473.

Roumie, C. L., Hung, A. M., Russell, G. B., Basile, J., Kreider, K. E., Nord, J., ... & SPRINT Research Group. (2020). Blood Pressure Control and the Association With Diabetes Mellitus Incidence: Results From SPRINT Randomized Trial. *Hypertension*, *75*(2), 331-338.

Reid RJ, Fishman PA, Yu O, et al. Patient-centered medical home demonstration: a prospective, quasi-experimental, before and after evaluation. Am J Manag Care. 2009;15:e71–e87.

SCHRAUWEN-HINDERLING, V., KOOI, M., HESSELINK, M., JENESON, J., BACKES, W., VAN ECHTELD, C., VAN ENGELSHOVEN, J., MENSINK, M. & SCHRAUWEN, P. 2007. Impaired in vivo mitochondrial function but similar intramyocellular lipid content in patients with type 2 diabetes mellitus and BMI-matched control subjects. Diabetologia, 50, 113-120.

Shah, A., & Afzal, M. (2013). Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. *Journal of Diabetes & Metabolic Disorders*, *12*(1), 1-10.

Sherwani, S. I., Khan, H. A., Ekhzaimy, A., Masood, A., & Sakharkar, M. K. (2016). Significance of HbA1c test in diagnosis and prognosis of diabetic patients. *Biomarker insights*, *11*, BMI-S38440.

Stumvoll, M., Goldstein, B. J., & Van Haeften, T. W. (2005). Type 2 diabetes: principles of pathogenesis and therapy. *The Lancet*, *365*(9467), 1333-1346.

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes care*, *23*(7), 943-950.

Trento, M., Fornengo, P., Amione, C., Salassa, M., Barutta, F., Gruden, G., ... & Porta, M. (2020). Self-management education may improve blood pressure in people with type 2 diabetes. A randomized controlled clinical trial. *Nutrition, Metabolism and Cardiovascular Diseases*, *30*(11), 1973-1979.

Tripathi, B. K., & Srivastava, A. K. (2006). Diabetes mellitus: complications and therapeutics. *Medical science monitor*, *12*(7), RA130-RA147.

Tuomilehto, J. (2000). Controlling glucose and blood pressure in type 2 diabetes: starting treatment earlier may reduce complications.

Wang, Q., Zhang, X., Fang, L., Guan, Q., Guan, L., & Li, Q. (2018). Prevalence, awareness, treatment and control of diabetes mellitus among middle-aged and elderly people in a rural Chinese population: A cross-sectional study. *PloS one*, *13*(6), e0198343.

Weber, M. A., Schiffrin, E. L., White, W. B., Mann, S., Lindholm, L. H., Kenerson, J. G., ... & Harrap, S. B. (2014). Clinical practice guidelines for the management of hypertension in the community: a statement by the American Society of Hypertension and the International Society of Hypertension. *Journal of hypertension*, *32*(1), 3-15.

Appendices

Patient Data Collection Form

Patient Name:		Patient ID:
Age: …… Y.O Height……... cm Weight……....kg BMI…….…kg/m^2 Address: ………………………………………………		Phone no. ……………………………… ……………
Gender • Male • Female	Employment Status • Unemployed • Employed	Educational Level • Illiterate • Primary/secondary • High school • Institute/University
Financially capability to buy medications: • Yes • Sometimes • No	Smoking Status • Yes • No	Family history of Diabetes • Yes • No • Uncertain
Duration of diabetes ……………………………… ……………	Recent HbA1C level ……………………………… …………… Recent blood pressure ……………………………… ……………	Other comorbidities ……………………………… ……………
Medications - - - - - -	Dose, frequency & route of administration	Side effects

Appendix II

Questionnaire on factors associated with patients' level of Awareness. Please tick (✓) the options below:

Awareness	Yes	No
1. Do you understand what an increased A1C means?		
2. Do you know the goal of A1C level we are trying to achieve?		
3. Did your physician give information on your antihyperglycemic medications?		
4. Do you know what your blood pressure should be coexisting with diabetes?		
5. Do you know your recent blood pressure?		
6. Do you have Information about your blood pressure?		

نەخوشێ هێژا، بەرسڤا ڤان پسیاران لسەر ئاگاهداریا بدە ب (✓)

نەخێر	بەلێ		ئاگاهداری
		ئەرێ تو دزانی زیادبونا A1C چ رامانێ ددەت؟	.1
		ئەرێ تو دزانی رێژا پێتڤی یا A1Cچەندە؟	.2
		ئەرێ نوژداریێ تە زانیاری ب شێوەکێ رێک و پێک ل سەر دەرمانێن نەخوشیا شەکرێ دانە تە؟	.3
		ئەرێ تو دزانی پێویستە پەستانا خوینێ دگەل نەخوشیا شەکرێ چەند بیت؟	.4
		ئەرێ تو دزانی پەستانا خوینا تە چەندە؟	.5
		ئەرێ تە زانیاری ل سەر پەستانا خوینێ هەنە؟	.6

Questionnaire on factors associated with patients' level of Attitude. Please tick (✓) the options below:

Attitude	Yes	No
1. Do you frequently monitor your blood glucose?		
2. When you feel like your diabetes is under control, do you skip taking your medication?		
3. Do you make your own modification in the dose of drugs prescribed?		
4. Do you regularly check your blood pressure?		
5. Do you always take your medication at the appropriate time?		
6. The following medications (Advil, Volfast, Ibuprofen, Mobic, Naproxen) are often used for pain or arthritis. Do you take at least one of them when you have pain?		
7. Do you ever miss doses of your medication on purpose?		
8. During sick days (e.g., flu), do you skip taking your diabetic medicine without consulting your physician/pharmacist first?		
9. Do you ever forget to take your medication?		
10. Do you ever stop taking your medication when you are feeling worse?		

نەخوشێ هێژا، بەرسڤا ڤان پسیاران لسەر هەڵوێست بدە ب (✓)

	نەخێر	بەلێ	هەڵوێست
			1. ئەرێ تو گەلەک جاران چاڤدێریا رێژا شەکرێ دکەی؟
			2. دەما تو هەست دکەی رێژا تە یا شەکرێ رێک و پێکە،ئەرێ تو دەرمانان رادوەستینی؟
			3. ئەرێ تو دەست کاریێ د ژمەه رێژا دەرمانان دا دکەی؟
			4. ئەرێ تو گەلەک جاران چاڤدێریا پەستانا خوینێ دکەی؟
			5. ئەرێ تو هەمی جاران دەرمانان ل کاتێ دەست نیشانکری وەردگری؟
			6. ئەڤ دەرمانه (Advil, Volfast, Ibuprofen, Mobic, Naproxen) دئێنه ب کارئینان بو ئازارێ یان روماتیزمێ. ئەرێ تو ئێک ژ ڤان دەرمانا ب کاردئینی دەمێ پێتڤی دبی؟
			7. ئەرێ تە جارەکێ ب کارئینانا دەرمانان رەتکریه بێی هیچ ئەگەر؟
			8. دەمێ روژێن سارمایێ وەکی پەرسیڤێ، ئەرێ تو ب کارئینانا دەرمانان رادوەستینی بێی کو سەرەدانا نوژداری یان دەرمانسازی بکەی؟
			9. ئەرێ تە جارەکێ ژبیرکریه دەرمانا بکار بینی؟
			10. ئەرێ تە جارەکێ دەرمان ب کار نە ئینایه دەما هەست دکەی نەخوشیا تە گرانترە؟

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CURRICULUM VITAE

Name	Saeed	Surname	Abdulraheem
Place of Birth	Duhok, Iraq	Date of Birth	05/03/1996
Nationality	Iraqi	Tel	+9647504980882
E-mail	Saeedzaxo@gmail.com		

Educational Level

	Name of the Institution where he/she was graduated	Graduation year
Postgraduate/Specialization	-	-
Masters	Near East University	2021
Undergraduate	Eastern Mediterranean University	2019
High school	Zakho High School	2014

Job Experience

Duty	Institution	Duration (Year - Year)
Pharmacist	Roonak Pharmacy	2020 - 2021

Foreign Languages	Reading comprehension	Speaking*	Writing*
English	Very good	Very good	Very good
Arabic	Good	Good	Good

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