Çankırı Karatekin University
Graduate School of Health Sciences

Master of Science Thesis

ASSESSMENT OF DIABETES KNOWLEDGE LEVELS IN ELDERLY PATIENTS WITH TYPE 2 DIABETES IN IRAQ

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Advisor
Asst. Prof. Dr. Tahsin Barış DEĞER

Çankırı 2022

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BY

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The Institute of Health Sciences
The Department of Nursing

The Degree of Master of Science

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Çankırı 2022

ACCEPTANCE AND APPROVAL

Aqeel Ali Yaseen YASEEN, the graduate student of The Institute of Health Sciences with the student number of 208205224, has successfully presented her thesis entitled "Assessment of diabetes knowledge levels in elderly patients with type 2 diabetes in Iraq" before the jury whose signatures are below, after fulfilling all of the requirements determined by the relevant regulations for the degree of Master of Science:

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ETHICS STATEMENT

The thesis entitled “Assessment of diabetes knowledge levels in elderly patients with type 2 diabetes in Iraq” which was prepared and presented as a thesis, was written by myself and in accordance with the scientific and academic rules and ethical conduct. The idea/hypothesis of my thesis solely belongs to my supervisor and to me. The research pertaining to the thesis was conducted by myself and therefore, all of the sentences used and interpretations within the work belong to me.

I declare the aforementioned issues to be correct.

Signature

24/11/2022

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ABSTRACT

ASSESSMENT OF DIABETES KNOWLEDGE LEVELS IN ELDERLY PATIENTS WITH TYPE 2 DIABETES IN IRAQ

Aqeel Ali Yaseen YASEEN

Master of Science in Nursing

Advisor: Asst. Prof. Dr. Tahsin Barış DEĞER

November 2022

Aims: This study seeks to assess the knowledge of elderly patients with type 2 diabetes about type 2 diabetes and to find the relationship between their socio-demographic characteristics and their level of type 2 diabetes knowledge.

Method: A descriptive cross-sectional study was conducted at Dhi-Qar city in Iraq, from July 5th, 2022, to August 24th, 2022, and comprised subjects aged >60 years with a diagnosis of type 2 diabetes mellitus. The sample size of the study was (n= 208) elderly people. The Arabic version of the Michigan Diabetes Knowledge Test (V.2016) was used for data collection. The Mann-Whitney U test and Kruskal-Wallis H were used for analysis.

Result: Of the 208 participants, the score of level of knowledge is statistically significant according to male gender, education status to university level and above, residence in rural areas, a normal value of HbA1C (Diabetes), fasting blood glucose (FBG) with high blood glucose, and post-prandial blood glucose (PBG) with high blood glucose ($p<0.05$ each).

Conclusion: In order to prevent and manage diabetes, social policies that will increase the knowledge level of the elderly are necessary.

2022, 63 pages

Keywords: Level of knowledge, diabetes mellitus, elderly patients.

ÖZET

IRAKTA TİP 2 DİYABETİ YAŞLI HASTALARDA DİYABET BİLGİ DÜZEYLERİNİN DEĞERLENDİRİLMESİ

Aqeel Ali Yaseen YASEEN

Hemşirelik, Yüksek Lisans

Tez Danışmanı: Dr. Öğr. Üyesi. Tahsin Barış DEĞER

Kasım 2022

Amaç: Bu çalışma, tip 2 diyabetli yaşlı hastaların tip 2 diyabet hakkındaki bilgilerini değerlendirmeyi, sosyo-demografik özellikleri ile tip 2 diyabet bilgi düzeyleri arasındaki ilişkiyi bulmayı amaçlamaktadır.

Yöntem: Tanımlayıcı bir kesitsel çalışma Irak'ın Dhi-Qar şehrinde 5 Temmuz 2022 ile 24 Ağustos 2022 tarihleri arasında yürütülerek tip 2 diyabet mellitus teşhisi konan 60 yaş üstü deneklerden oluşmuştur. Araştırmanın örneklem büyüklüğü (n= 208) yaşlı bireydir. Verilerin toplanmasında Michigan Diyabet Bilgi Testi'nin (V.2016) Arapça versiyonu kullanılmıştır. Analiz için Mann-Whitney U testi ve Kruskal-Wallis H kullanılmıştır.

Bulgu: 208 katılımcıdan düzey bilgisi puanı, erkek cinsiyet, üniversite ve üzeri eğitim durumuna, kırsal kesimde ikamet durumuna, normal HbA1C değerine, yüksek kan glukoz açlık kan glukoz (FBG) ve yüksek kan glukoz yemek sonrası kan glukoz (PBG)'ye göre istatistiksel olarak anlamlıdır (her biri, $p > 0,05$).

Sonuç: Diyabetin önlenmesi ve yönetimi için yaşlıların bilgi düzeyini artıracak sosyal politikalara ihtiyaç vardır.

2022, 63 sayfa

Anahtar Kelimeler: Bilgi düzeyi, Diyabet mellitus, Yaşlı hastalar.

PREFACE AND ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Asst. Prof. Dr. Tahsin Barış DEĞER for his directives to finish this work. This study was funded by Aqeel Ali Yaseen YASEEN under the project assessment of diabetes knowledge levels in elderly patients with type 2 diabetes in Iraq.

Aqeel Ali Yaseen YASEEN

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INDEX OF ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS	**Meaning**
%	Percentage
ADA	American Diabetes Association
ASCVD	Atherosclerotic cardiovascular disease
CA0	The value of coefficient alpha under the null hypothesis
CA1	The value of coefficient alpha at which the power is computed
CDC	Centers for Disease Control
CKD	Chronic kidney disease
COVID-19	Coronavirus disease – 2019
DNA	Deoxyribonucleic Acid
DPP-4	Dipeptidyl peptidase 4
GLP-1	Glucagon-like peptide – 1
GLUT-4	Glucose transporter-4
H	Kruskal Wallis test
H0	The null hypothesis that coefficient alpha equals CA0.
H1	The alternative hypothesis that coefficient alpha does not equal CA0
HbA1C	The hemoglobin A1C
IDF	International Diabetes Federation
IQR	Inter Quartile Range
K	The number of items or raters
M	Median
MENA	Middle and North Africa Area

N	The total sample size
NCECE	National Center for Equitable Care for Elders
NIDDK	National Institute of Diabetes and Digestive and Kidney Disease
OGTT	Oral glucose tolerance test
PVD	Peripheral vascular disease
RBS	Random blood sugar
SGLT-2	Sodium-glucose cotransporter-2
WHO	World Health Organization
z	Mann Whitney U test

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1. INTRODUCTION

Diabetes mellitus (DM) is a long-term metabolic condition characterized by elevated levels of glucose in the blood. Insulin action on target tissues (or insulin resistance) or a lack of pancreatic insulin production may induce a glucose metabolism disorder (GMD). When persistent hyperglycemia damages or destroys the heart, blood vessels, eyes, kidneys, and nerves, symptoms may be seen even in newly diagnosed individuals (Chentli *et al.* 2015).

The accumulation of many molecular and cellular changes over time causes aging. In the long term, this leads to a decrease in physical and mental abilities, an increased risk of disease, and a wide range of chronic disorders type 2 diabetes mellitus (T2DM) is one of the most important chronic disorders in the elderly (Hameed 2020).

As the population ages, so does the risk of developing DM. Older persons with DM are one of the fastest-growing demographics in the diabetes epidemic, owing in large part to the unprecedented aging of the global population. Over the next few decades, the number of older persons is expected to climb significantly (Kalyani *et al.* 2017).

Most instances of diabetes in elderly people are T2DM rather than T1DM. Up to 18 % of the population aged 65 and older is estimated to have DM, and it which is somewhat more frequent in females than in males. When it comes to the elderly, several physiological changes brought on by age increase the risk of diabetes, particularly in facilities such as nursing homes and hospitals (Abedalrahman & Al-Hadithi 2013).

About 537 million people globally have diabetes in 2021, and that number is expected to climb to 643 million by 2030 and 783 million by 2045, according to the report from the International Diabetes Federation (IDF) (Liu *et al.*2022).

DM is a severe, long-term disease which affects the health and well-being of patients, their families, and society as a whole. One of the top ten killers of adults, it was blamed

for the deaths of four million people worldwide in 2017. Diabetes-related medical expenses were estimated at $727 billion worldwide in 2017. 285 million individuals had diabetes in 2009, which rose to 366 million in 2011 and 382 million in 2013, and a total of 415 million people had the disease by 2015. According to the Centers for Disease Control and Prevention (CDC), nearly 90% of the total may be linked to the aging population and a rise in urbanization. The reason for this increase is as yet unknown (Saeedi *et al.* 2019).

The Middle East and North Africa region have the second highest prevalence of diabetes at 9.2%. The prevalence of diabetes in the MENA region is expected to increase by 110% between 2017 and 2045 and reach 629 million worldwide by 2045. Diabetes is a condition that negatively affects the body. Adult patients (20-79 years old) had a mortality rate from diabetes in 2017 of 10.7 %. More than half of all deaths in the MENA region were attributed to diabetes, which caused 373557 deaths in 21 countries and territories, including Iraq. Diabetes affects an estimated 1.4 million Iraqis in Iraq, and the prevalence of type 2 diabetes mellitus (T2DM) is reported to be between 8.5% and 14.9%. In a survey of more than 5400 people in Basra, Iraq, 19.7 percent of participants between the ages of 19 and 94 were found to have diabetes (Abusaib *et al.* 2020).

Many societies suffer from a lack of information about DM, and Iraqi society is one of those societies. The availability of information about DM can lead to a better understanding of it and thus will help in reducing complications, negative effects, and exorbitant health care costs resulting from diabetes. DM awareness programs have played an important role in the prevention and management of diabetes. Assessment of knowledge about DM is one of the important ways to identify problems related to the disease, and this will contribute to the prevention, reduction of complications, and management of the disease. Health problems increase with age, and the elderly suffer from many health problems. T2DM in the elderly is a significant health problem in Iraq. This study was planned to assess knowledge about T2DM in the elderly and its correlation with socio-demographic characteristics among elderly patients. This study is the first in Iraq.

1.1. General Informatıon

1.1.1. Definition of diabetes mellitus

DM is a long-term illness that hinders the body's ability to convert food into energy. The majority of the calories consumed are converted into glucose by the body and absorbed into circulation. Insulin is secreted by the pancreas in response to an increase in blood sugar. Insulin is like a key that unlocks the door allowing glucose in the blood to enter cells and be used as energy. DM is characterized by either inadequate insulin production or impaired insulin use. When cells cease reacting to insulin or when insulin production is inadequate, excess glucose remains in circulation (Centers for Disease Control and Prevention 2022 a).

The inability to properly use insulin results in elevated blood glucose levels in people with T2DM. T2DM accounts for 95% of all cases. It takes years to manifest symptoms:, thus, people are most often diagnosed with T2DM in sdulthood (World Health Organization 2022).

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1.1.2. Prevelence of diabetes mellitus

The World Health Organization (WHO) estimates that by 2025, the global prevalence of diabetes will have increased, with 90% of these cases being Type 2 Diabetes (T2DM). The International Diabetes Federation predicts that worldwide 693 million people will be diagnosed with diabetes by 2045 (Saber & Daoud 2018).

As people are living longer, they are also more likely to get T2DM. Type 2 diabetes increased in prevalence from 16% to 23% in the United States between 1995 and 2004, according to a study. Current estimates place the prevalence of diabetes among Americans aged 65 and older between 22 and 33%. In the next twenty years, diabetes will become an epidemic. Research estimates that the population of persons aged 65 and over will increase by a factor of 4.5 between 2005 and 2050 (Yakaryılmaz & Öztürk 2017).

The financial impact of T2DM is heavy for patients, their families, and countries since the elderly are disproportionately affected. By 2030, the rate is projected to reach 8.3%, up from the 7.7% recorded in 2013. Most people with type 2 diabetes in developed countries are above the age of 65, with just 8% being under the age of 44 while most people with diabetes in developing countries are above the age of 45, with just 25% being under the age of 44. By 2045, the International Diabetes Federation predicts that 352 million people will have impaired glucose tolerance (Asiimwe *et al.* 2020).

Six of the top ten countries with the highest incidence of DM are in the Middle East (Kuwait, Lebanon, Qatar, Saudi Arabia, Bahrain, and the United Arab Emirates). The prevalence of DM among Arabs is staggering: among the 20 countries with accessible data, about 20.5 million people have DM, and another 13.7 million have impaired glucose tolerance and are classed as pre-diabetic. Over three-quarters (73.4%) of DM in Arab countries are under the age of 60, thus increasing the burden of disability associated with diabetes. This is in contrast to developed nations, where most diabetics reach retirement age (Mansour *et al.* 2014).

In 2020 people over the age of sixty constituted 7.56% of the total population of Iraq. Iraq is undergoing a demographic shift, with the number of people aged 60 and older predicted to more than quadruple between 2020 and 2050 from two million (5.1 % of the total population) to 7.5 million (10.6%) (O'Neill 2022, United Nations Population Fund Arab 2021).

According to a report by the International Diabetes Federation, Diabetes Atlas. In 2021, 10.7 % of Iraqis aged 20 to 79 had T2DM, a percentage that is referred to as the prevalence of T2DM in Iraq (International Diabetes Federation 2021a).

And to a study the prevalence of T2DM in Iraq has reached epidemic proportions, affecting the general health situation. T2DM patients are estimated at 2 million people or 7.43% of the total population of the country (Ali *et al.* 2019).

Iraq is badly underrepresented in diabetes epidemiology and randomized controlled studies. The prevalence of DM in Iraq's population and the degree to which it has to be treated are both unknown (Abusaib *et al.* 2020).

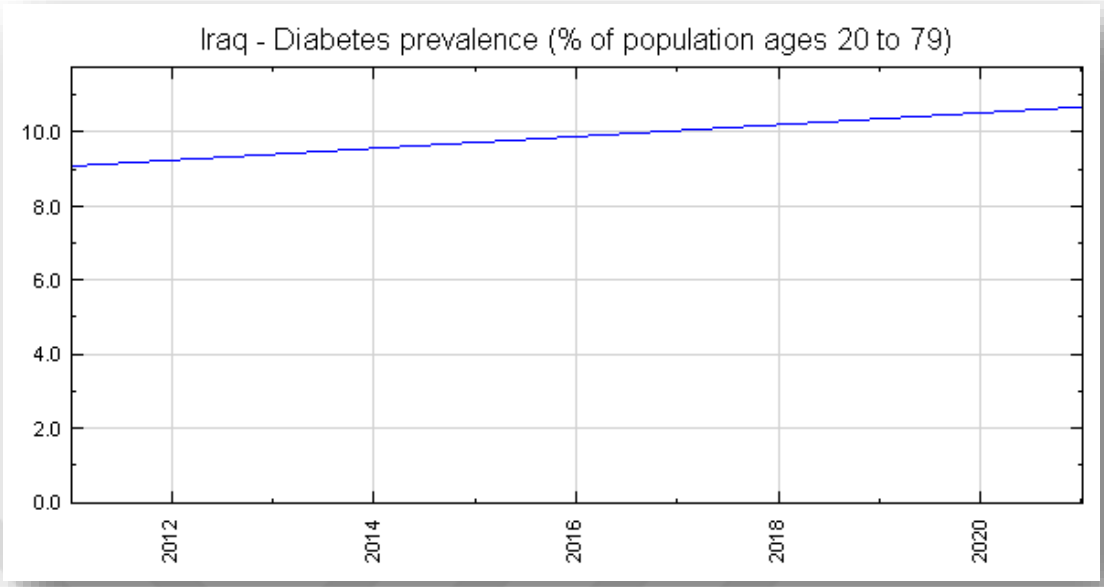

Figure 1.1: Iraq diabetes mellitus prevelance of population age 20-79 years old (IDF 2021b).

1.1.3. Etiology of diabetes mellitus

T2DM is caused by a combination of several different variables. These include being of advanced age, having a family history of DM and being over weight. Some groups of people have a higher incidence of T2DM. More people of color (including Blacks, Asians, Native Americans, and those of Pacific Islander descent) suffer from T2DM than whites (Chintamani & Mani 2021)

Inadequate insulin production and insulin resistance both contribute to the development of T2DM. Endogenous insulin is insulin produced by the body's own pancreas. However, either insufficient insulin is produced or insulin is poorly used, or both, in those with DM. Multiple genes may be at play in the development of T2DM, the exact nature of which remains unknown despite extensive research. Numerous persons with T2DM have inherited errors that put them at a greater risk for insulin resistance. People who have a first-degree relative with DM are ten times more likely to have the condition themselves. T2DM is associated with metabolic problems. The first component is insulin resistance, which occurs when tissues in the body do not

react to the action of insulin because insulin receptors are either unresponsive or inadequate in number. Muscle, fat, and liver cells are where insulin receptors are most found in the body. Hyperglycemia occurs when glucose cannot enter cells correctly due to improper insulin utilization. When blood glucose levels are up, the pancreas typically reacts by generating more insulin, assuming cell activity is adequate, in the early stages of insulin resistance. Because of this, hyperinsulinemia and hyperglycemia will coexist temporarily.

When the pancreatic' cells are tired from overcompensating with insulin production or when cell mass is reduced, the body's capacity to produce insulin significantly decreases, contributing to the development of T2DM. It is unclear what causes cells to lose their adaptability. There may be a connection to the side effects of chronically elevated blood glucose or free fatty acids in the bloodstream. Further, glucagon synthesis is boosted by pancreatic cells. Because of this, a third element emerges: the liver produces glucose inappropriately. The liver's release of glucose in response to blood levels is erratic and out of step with what the body really requires at any one moment. A change in hormone and cytokine production by adipose tissue is a fourth contributor (adipokines). Adipose tissue adipokines may contribute to the onset of T2DM through influencing glucose and lipid metabolism. It is hypothesized that adipokines contribute to insulin resistance, T2DM, and CVD via inducing chronic inflammation (CVD). Adiponectin and leptin are the two adipokines considered to have the most impact on insulin sensitivity. A person’s central nervous system, kidneys, and gastrointestinal tract all play a part in the onset of T2DM. The likelihood of acquiring T2DM is higher in those who have metabolic syndrome. Elevated blood glucose, abdominal obesity, hypertension, elevated triglycerides, and low HDL levels are the hallmarks of metabolic syndrome (HDLs). In order to be diagnosed with metabolic syndrome, a person has to exhibit at least three of the five symptoms. Those who are overweight and have metabolic syndrome may lower their risk of developing DM by losing weight and increasing their level of physical activity (Harding *et al.* 2019).

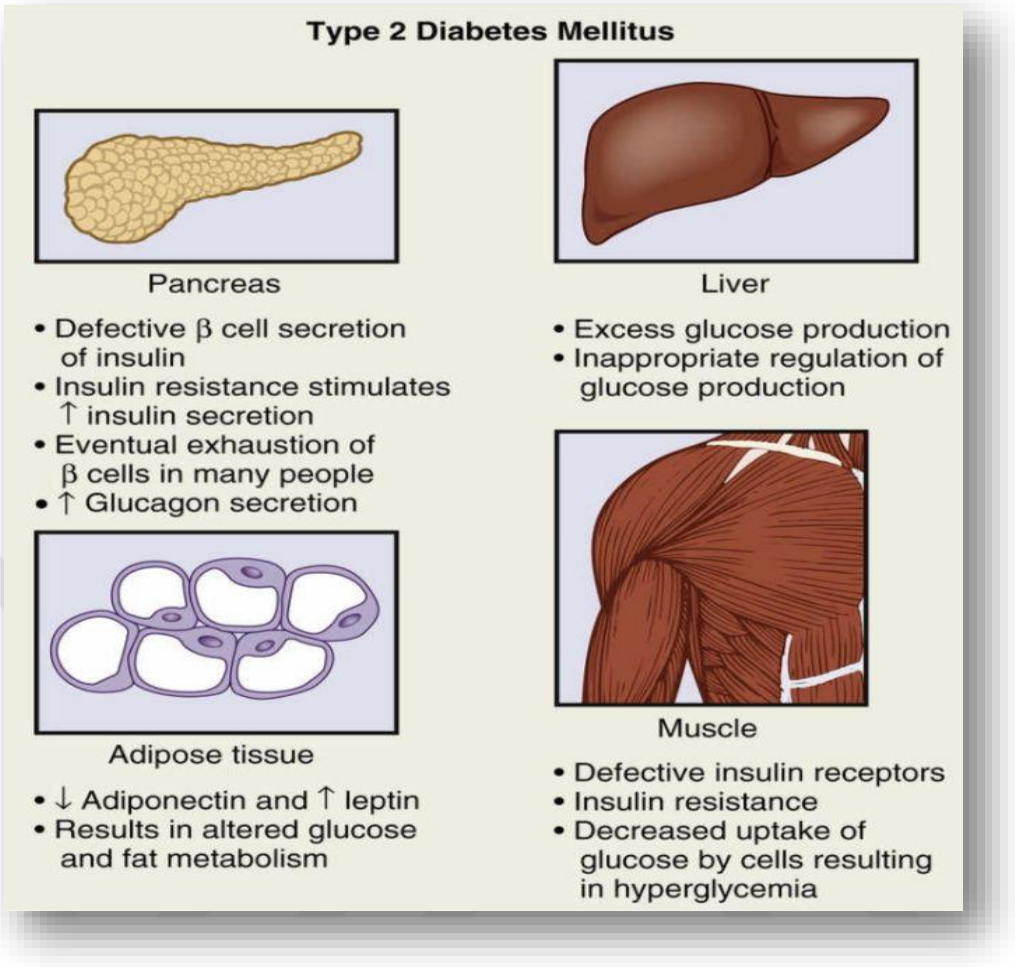

Figure 1.2: Etiology of diabetes mellitus type 2 (Harding *et al*. 2019).

1.1.4. Pathophysiology of diabetes mellitus

In this type of DM, insulin resistance and cell dysfunction are the most common problems associated with insulin. Many cellular pathways are disrupted, resulting in a decreased response or sensitivity of cells in peripheral tissues, such as muscle, liver, and adipose tissue, to insulin. In the early stages of the disease, cells become hyperactive due to decreased insulin sensitivity (Banday *et al.* 2020).

Although all types of DM may affect people of any age, T2DM is commoner in those over the age of 65. Since the risks of diabetes-related problems are connected with hyperglycemia across time, the diagnostic criteria for DM are consistent across age

groups. Genetic, lifestyle, and age-related factors all contribute to the increased vulnerability of the elderly to developing T2DM. Both the ability of b-cells to secrete insulin and the sensitivity of tissues to insulin are impacted, contributing to the development of hyperglycemia. Comorbidities and functional impairments linked with age further worsen the situation when T2DM develops in an older individual. With T2DM, hyperglycemia occurs when there is a discrepancy between glucose synthesis (i.e., hepatic glucose production during fasting) and glucose intake (i.e., meal consumption) and insulin-stimulated glucose absorption in target tissues, primarily skeletal muscle. This imbalance in glucose control in the elderly has several causes. Current research suggests that aging has a direct influence on the pathogenesis of diabetes via reduction of b-cell function, leading to a drop in insulin production, even while resistance to peripheral insulin action contributes to impaired glucose homeostasis (Lee & Halter 2017).

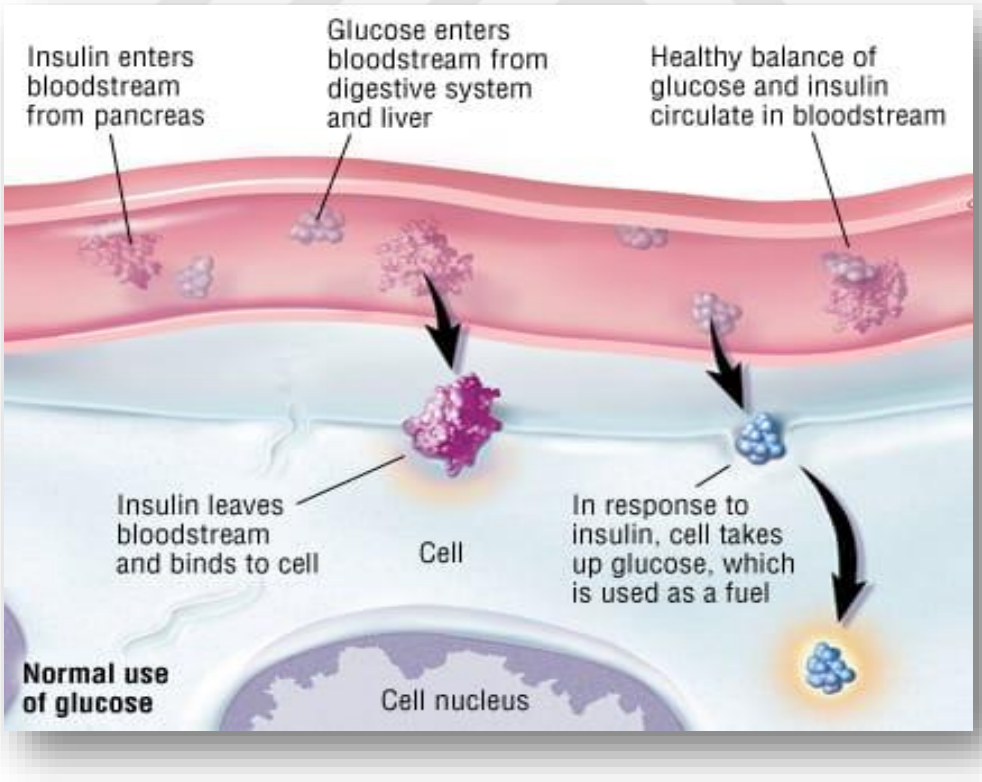

Figure 1.3: Pathophysiology of diabetes mellitus (Kindred Healthcare 2013).

1.1.5. Risk factors of diabetes mellitus

Risk factors for type 2 diabetes include:

1. Prediabetes.
2. Overweight.
3. Age 45 years and over.
4. Family history if a parent, brother, or sister had type 2 diabetes.
5. Lack of physical activity
6. If the patient had gestational diabetes.
7. Ethincty: African American, Hispanic, Latino, American Indian, or Alaska Native. Some Pacific Islanders and Asian Americans are also at higher risk.
8. If patients have non-alcoholic fatty liver disease, they are also at risk of developing type 2 diabetes
9. Depression
10. Smoking
11. More sleep or little sleep (CDC 2022 b).

1.1.6. Symptoms of diabetes mellitus

Symptoms of T2DM can emerge gradually over a lengthy period of time. It's possible for someone with T2DM to go undiagnosed for years (Mayo Clinic 2021).

Tiredness, increased hunger or thirst, unintentional weight loss, frequent urination, blurred vision, and a persistent need to urinate are all symptoms of T2DM. Skin infections and lengthy recovery times are possible outcomes of cuts and bruises. Because the onset of symptoms for T2DM may be gradual and unnoticed, some people may be completely ignorant that they have the disease. These signs and symptoms may be dismissed as "getting old" in the elderly, but they may really indicate a more serious problem (National Institute on Aging 2019).

Only a handful of the aforementioned signs and symptoms may be present in any given person. Half of those who are diagnosed with T2DM for the first time do not even know they have it since they show no symptoms.

1.1.7. Diagnosis of diabetes mellitus

four different laboratory tests—fasting blood glucose, hemoglobin A1c, postprandial glucose, and oral glucose tolerance test — can detect T2DM. The diagnostic utility of each is described in full in the table (1.1). Diagnosis criteria vary depending on whether or not the patient is experiencing symptoms. People who are asymptomatic should be assessed for their risk of acquiring diabetes and tested for the condition. (Royal Australian College of General Practitioners 2020).

Table 1.1: Diagnostic tests for T2DM (Royal Australian College of General Practitioners 2020)

Diagnostic Method	Use when diagnosing diabetes	Further notes
FBG	Fasting (eight hours)	It may also be used to detect IFG
HbA1c	Non-fasting In asymptomatic individuals, abnormal HbA1c results should be repeated and validated on a separate day, unless two abnormal tests (eg FBG and HbA1c) are already available from the same day of testing. FBG and OGTT may aid diagnosis in the following conditions when HbA1c is less accurate (specificity and/or sensitivity). post-traumatic type 2 diabetes (eg pancreatitis), fast development with sepsis and steroid usage, etc. • within four months postpartum If recently a blood or iron transfusion, or if there hemoglobinopathy or hemolysis	Inapplicable for evaluating IGT Increased microvascular illness is associated with an HbA1c level of over 6.5% (48 mmol/mol), and HbA1c is a stronger indicator of macrovascular disease than FBG or two-hour post-glucose tolerance testing.
OGTT	Fasting (eight hours) and after two hours from drinking water with sugar The oral glucose tolerance test is the most commonly used glucose tolerance test (OGTT). A blood sample will be obtained prior to the start of the test. will then be required to consume a beverage containing a certain level of glucose (usually 75 grams). After consuming the solution, blood will be drawn every 30 to 60 minutes. The examination might last up to three hours.	Only method able to detect IGT. May concurrently detect IFG
PBG	Non-fasting The amount of glucose in the blood after eating is an essential predictor of metabolic and overall health. Monitoring postprandial glucose levels might help to control glucose levels.	

1.1.8. Treatment of diabetes

Elderly people with T2DM should be treated according to the following general guidelines:

• It is essential that the treatment strategy and glycemic control goals are based on a thorough evaluation of the patient, which takes into account the patient's comorbid conditions as well as his or her functional and cognitive abilities, as well as any mood disorders (with a focus on depressive disorders).

• Establishing a shared decision-making process with patients and their caregivers is critical since it takes into account their expectations, preferences, and skills as well as their wants and aspirations.

• Preserving functional ability and enhancing the quality of life should be the primary goals of antidiabetic medication.

• Anti-diabetic medicines have a number of possible side effects, contraindications, and interactions that must be considered. (Gómez-Huelgas *et al.* 2018).

1.1.8.1. Lifestyle therapy

Making positive adjustments to one's lifestyle, such as losing weight if one is overweight, starting an exercise routine, or giving up smoking, is beneficial for people of any age. Reducing cardiovascular risk is recommended not just for younger, healthier individuals, but also for those who are already healthy and who are older than 75 and have DM. Treatment of DM in the elderly requires careful thought because of their unique needs (Abdelhafiz & Sinclair 2013).

When it comes to managing diabetes, nutritional therapy is the most challenging and crucial aspect. In the early stages of DM, a change in diet may lower A1c values by as

much as two percentage points. The dietary goals of an individual can only be met by a collaborative effort that considers the individual's unique behavioral, cognitive, social, economic, cultural, and spiritual circumstances. Managing DM with nutrition requires adhering to healthy eating habits. Every member of society should eat healthily without regard to whether or not they have DM. A low-sugar, low-calorie diet may be suggested by a doctor if DM is diagnosed. Each person has unique needs and goals, therefore it is important that the planning process takes these factors into account. Test findings for renal function, blood glucose, and A1c, as well as information on the success of nutritional therapy, should all be included in the measuring procedure. Clinical measurements include weight, body mass index, waist circumference, and blood pressure (Lewis *et al.* 2018).

Physical activity. Exercising regularly is very important, as it helps in losing weight and maintaining a normal weight, which helps in maintaining stable blood sugar levels.

Aerobic exercises. Walking, swimming, cycling, or running are all examples of aerobic exercises. Adults should engage in moderate aerobic activity for 30 minutes or more on most days of the week, for a total of 150 minutes per week.

Resistance exercise. Resistance training includes weight lifting, yoga, and calisthenics, an exercise that increases strength, balance and the ability to perform activities of daily living with greater ease. Adults with T2DM should do two or three sessions of resistance training each week (Mayo Clinic 2022).

Diabetes mellitus self-management support (DSMES) When developing a treatment strategy, DSMES should be given the same weight as choosing the right medications. An integral part of developing and enforcing care guidelines is DSMES. In most cases, participants in DSMES courses meet with instructors face-to-face, either in small groups or one-on-one. DSMES should be available on a continuous basis because of the dynamic character of T2DM. At the time of diagnosis, once yearly, in the event of difficulties, and at times of transition in both life and care, DSMES should be offered. There is a large body of high-quality research showing that DSMES is beneficial in

lowering blood glucose levels, improving clinical and psychosocial outcomes, decreasing hospitalizations and deaths overall, and saving money. Lifestyle behaviors (healthy eating, physical activity, and weight management), medication-taking behavior, self-monitoring when necessary, self-efficacy, coping, and problem-solving are all central to DSMES, which is why it is taught through structured educational programs by trained diabetes care and education specialists. In particular, DSMES takes into account the unique values and perspectives of each patient. While DSMES is helpful in the psychosocial treatment of persons with DM, it is not a substitute for referral to mental health services when necessary. Poor DM outcomes may be attributed in part to the presence of psychiatric problems, such as disordered eating habits, which are widespread but often undiagnosed.

The most successful DSMES courses are those that have a theory-based, organized curriculum with a minimum contact time of 10 hours. While there is some evidence that online learning reinforcement systems are successful, it is possible that a more holistic approach to education using many strategies might be more beneficial. Telehealth and web-based DSMES programs were successfully implemented during the 2019 coronavirus disease (COVID-19) pandemic, and this new research further supports their value. More people with DM may benefit from DSMES if it is delivered through technological means such as mobile applications, simulation tools, digital coaching, and digital self-management interventions. More active participation from patients with DM is associated with greater HbA1c decreases. Trials employing digital tactics to aid in behavior modification are still in their infancy, therefore the data they provide are preliminary and very variable (Davies *et al.* 2022).

1.1.8.2. Pharmacological therapy

The American Diabetes Association (ADA) has released updated guidelines for managing diabetes medications in 2019 to better serve people with T2DM. The primary goal of managing T2DM is to reduce the risk of complications. Despite the serious consequences of untreated T2DM, therapy promotes control of blood glucose level in the elderly. uncontrol blood glucose level is associated with a higher risk of

falls, injuries, hospitalization, and stress, all of which may place a significant strain on the patient and the healthcare system (Palmer 2020).

The medcation include;

1. Biguanid. This may reduce glucose in the blood and enhance insulin sensitivity. For the vast majority of persons with type 2 diabetes, this is the first line of defense.

2. Sulfonylureas. Insulin-producing enzyme boosters are oral medicines.

3. Meglitinides. These drugs increase insulin secretion by the pancreas quickly, but only for a limited time.

4. Thiazolidinediones. Increased insulin sensitivity is the result of taking these.

5. DPP-4 inhibitors are molecules that block the action of dipeptidyl peptidase 4. These drugs are less strong yet nonetheless effective in lowering blood sugar levels.

6. The Glucagon-like peptide-1 agonists (GLP-1 receptor agonists). These reduce gastrointestinal activity and increase insulin sensitivity.

7. Inhibitors of the Sodium-Glucose Cotransporter 2 (SGLT2) inhibitors. These facilitate sugar excretion by the kidneys through urination (Wood & Pietrangelo 2021).

8. Insulin - people with T2DM whose blood sugar is unmanageable with oral medications and lifestyle adjustments are prescribed insulin (i.e. diet and exercise). However, there is mounting evidence that starting insulin therapy early in the course of diabetes may enhance long-term control. If the patient takes more insulin than the body requires, the result will be low blood sugar and weight gain. The likelihood of these negative consequences is reduced when insulin dosage is modified in response to the body's requirements. As the first line of defense against T2DM, insulin shots

may be used in certain cases. Insulin may be used in conjunction with or as a replacement for oral medications in various situations (Wexler 2022).

1.1.9. Complication of diabetes mellitus

A number of bodily systems are affected by hyperglycemia and the metabolic dysfunctions it causes in glucose, lipid, and protein metabolism. Hyperglycemia and the associated metabolic irregularities negatively impact the proper development and operation of micro- and macrovasculature, which are crucial to the structure and function of organs throughout the body, and this disruption takes place over time. Vascular structural and functional abnormalities lead to micro- and macrovascular disease. Damage, dysfunction, and ultimate failure of organs including the eyes, kidneys, heart, and nerves are hallmarks of these conditions. Diseases of the retina, if left untreated, may cause blindness. Damage to the kidneys may lead to nephropathy and eventually renal failure. Conditions affecting the heart include hypertension and coronary artery disease. Nerve damage may cause either autonomic or peripheral neuropathy. Foot infections, including ulcers demanding amputations, and Charcot joint (osteoarthropathy) are typically related to long-term peripheral neuropathy. Autonomic neuropathy is characterized by cardiovascular, gastrointestinal, and genitourinary (including sexual) dysfunctions. Atherosclerotic cardiovascular disease is common among diabetics and is a major cause of morbidity and mortality (Banday *et al.* 2020).

Among the most common diabetic complications in those over 60 years of age are

1. Kidney disease, as well as renal failure

2. Permanence of a visual impairment

3. A heart attack

4. Stroke

5. Narrowing the blood arteries in the legs and feet is known as a peripheral vascular disease (PVD).

6. Neuropathy of the peripheral nervous system

7. Hypoglycemic state (hypoglycemia).

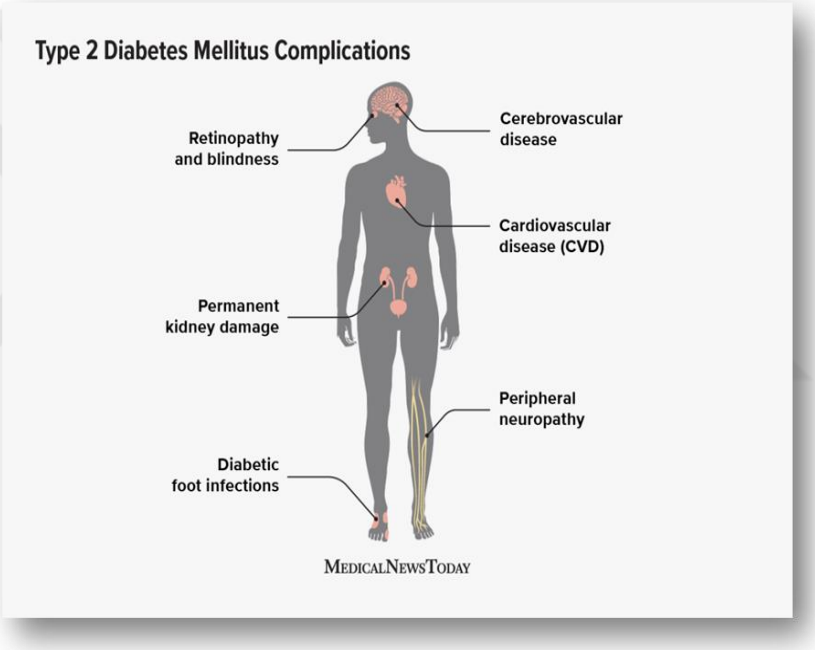

Figure 1.4: Complication of T2DM (Wood & Slater 2022)

1.1.10. Nursing roles of diabetes mellitus

The nursing role in DM management includes the following:

1. Assess the risk factors for T2DM.

2. Educate the patient and caretaker on methods for managing T2DM, such as self-

monitoring of blood glucose (SMBG), insulin, non-insulin injectables, OAs, nutrition, physical activity, and hypoglycemia management.

3. When caring for a diabetic patient who is critically sick or undergoing surgery, establish a strategy to prevent hypo- or hyperglycemia.

4. Hypoglycemia, diabetic ketoacidosis, and hyperosmolar state (HHS) should all be evaluated for implementing appropriate actions.

5. Administer intravenous fluids and insulin, or otherwise personally oversee such procedures, in patients with acute problems.

6. Evaluate for long-term consequences such as cardiovascular disease, retinopathy, nephropathy, neuropathy, and foot problems.

7. Instruct the individual and their caretakers on how to avoid and effectively deal with long-term diabetes complications (Tyerman *et al.* 2022).

1.1.11. Nursing education of diabetes mellitus

Knowledge is highly associated with diabetes mellitus, as the greater the knowledge of patients, the greater the chances of preventing complications and controlling blood glucose levels. Healthcare providers, including nurses, play an important role in managing diabetes by evaluating the disease and providing appropriate health care. Evaluating the knowledge of elderly patients with type 2 diabetes is one of the defining methods and tools to find out the extent of patients' ability to understand diabetes and its management. Lack of knowledge about diabetes is one of the most important nursing diagnoses.

Nurses must continue to evaluate the knowledge and self-care practices of patients with long-term diabetes. Instead of relying just on the patient's self-report of self-care habits, the assessment of these patients must incorporate direct observation of abilities.

These patients must also be adequately informed of risk factor management, foot care, and eye care preventative measures. In an effort to halt future problems, some patients may have rekindled interest in managing their diabetes on their own. Others may experience sadness and guilt. The patient is urged to talk about their emotions and concerns around potential problems. The nurse fills in the gaps with pertinent information on diabetic complications.

Table 1.2: Nursing health education for DM patient (Harding *et al.* 2019).

Component	
Disease process	• Introduce the pancreas and islets of Langerhans • Describe how insulin is made and what effects its production. • Discuss the relationship of insulin and glucose. • Explain the difference between type 1 and type 2 diabetes.
Physical activity	• Discuss the effect of regular exercise on managing blood glucose and improving cardiovascular function and general health.
Menu planning	• Stress the importance of a well-balanced diet as part of a diabetes management plan. • Explain the impact of carbohydrates on blood glucose levels.
Medication	• Ensure that the patient understands the proper use of prescribed medication (e.g. insulin, OAs, non-insulin injectables). • Account for a patient's physical or other limitations or inabilities for self-medication. If necessary, involve the family or caregiver in proper use of medication. • Discuss all side effects and safety issues about medication.
Monitoring blood glucose	• Teach correct blood glucose monitoring. • Include when to check blood glucose levels, how to record them, and how to adjust insulin levels, if necessary.
Risk reduction	• Ensure that the patient understands and appropriately responds to the signs and symptoms of hypoglycemia and hyperglycemia. • Stress the importance of proper foot care, regular eye examinations, and consistent glucose monitoring. • Teach the patient about the effect that stress can have on blood glucose.
Psychological	• Help the patient identify resources that are available to help with adjustment and answer questions about living with a chronic condition such as diabetes.

1.1.12. Prevention of diabetes mellitus

There is significant evidence that type 2 diabetes may be prevented or delayed by changing one's lifestyle habits, such as eating a healthier diet, increasing physical activity, and losing 5% to 7% of one's body weight. The Diabetic Prevention Program (DPP) is the biggest clinical experiment ever conducted. Approximately 20% of DPP participants were above the age of 60 at the time of participation. When compared to younger persons, these older people had a 71% lower risk of getting type 2 diabetes (National Institute of Diabetes and Digestive and Kidney Disease 2017).

Ten-year follow-ups of DPP participants were conducted to assess the sustainability of the program's positive effects. Those aged 60 and above had a 49% drop in risk, compared to a 34% overall reduction. Moreover, lifestyle intervention has been demonstrated to be effective in raising the quality of life across a variety of dimensions and decreasing cardiovascular risk factors in the aged (Kirkman *et al.* 2012).

1.2. Importance of Study

DM is becoming more common among the elderly as the diabetes epidemic spreads and as diabetics enjoy longer lives. People over the age of 65 make up a large share of the diabetic population. Many people think of the elderly as belonging to a unique and homogenous group. As with any other group of individuals, the aged are not homogeneous. Despite the fact that many people are still as physically active as they were when they were younger, the aging process may be difficult for others. People with chronic physical and mental health conditions, such as diabetes, have unique challenges while trying to manage their disease (Kalra & Sharma 2018).

A person's age is a significant risk factor for the development of prediabetes and T2DM later in life. Over the last few decades, there has been a noticeable increase in the world's old population, and this is expected to continue (Mordarska & Godziejewska-Zawada 2017).

In addition to being the fifth leading cause of death in the world, diabetes is a chronic and non-communicable illness that affects an estimated 5.4 million people worldwide. Growth of the diabetic patient population is influenced by demographic change and the aging of societies, among other factors. Every society is seeing a rise in the incidence of diabetes as people become older, and it is most frequent in the oldest age groups. DM is a critical problem because of the high cost of the illness, the irreversible consequences, the financial burden it places on the healthcare system, and the toll it takes on the quality of life of those who are affected (Borhaninejad et al. 2017).

Long-term complications from T2DM include cognitive and functional impairments, as well as a high demand for health care and social services. T2DM requires long-term care, putting a strain on the resources of the patient, their families, and the public sector. T2DM, on the other hand, is regarded as a self-managed illness in which individuals are able to take care of 99% of their own requirements. Patients with T2DM might benefit from self-care measures that allow them to keep their independence while lowering the strain on the hospital.

Chronic diseases are also costly to the economy. As geriatrics is still a relatively new profession in Iraq, primary health care institutions are struggling to provide proper treatment for the elderly. As a result, Iraq's health care system must change to meet the demands of the country's aging population, particularly individuals with numerous health issues and complicated health care requirements. Elderly participation in the creation and enhancement of long-term care services is also critical. Through the promotion of health care among the elderly, an evaluation of knowledge about T2DM may expand the information base regarding how much knowledge the elderly have about T2DM in order to assist them to utilize health care services.

1.3. Problem Statement

It is common for older diabetics to misunderstand diabetes. For elderly diabetics, there is a lack of information regarding diabetes. Although many articles and research papers

have been published on the knowledge of people with diabetes, they tend to focus on middle-aged people.

It is necessary to study the knowledge of Iraqi elderly people with diabetes about diabetes mellitus for the reasons mentioned above. The aim of this research was to assess the knowledge of older people with diabetes regarding diabetes, as well as the relationship between demographic variables and knowledge of diabetes. This study is the first to be conducted in Iraq.

1.4. Objective

1. To assess the knowledge of elderly patients with diabetes mellitus type 2.

2. To find out the relationship between patients' diabetic knowledge and their socio-demographic characteristics

1.5. Hypothesis

H0: Elderly patients with type 2 diabetes have no knowledge about type 2 diabetes.

H1: Elderly patients with type 2 diabetes have knowledge about type 2 diabetes.

1.6. Limitation

1. Lack of availability of previous studies on the knowledge of diabetes mellitus in the elderly.

2. Patients’ fear of being interviewed due to the COVID-19 pandemic.

3. Hearing and vision and talking problems in the elderly.

4. Difficulty dealing with elderly people who suffer from psychological and mental problems.

5. As with the majority of studies, the design of the current study is subject to limitations.

2. MATERIAL AND METHOD

2.1. Study Design

A descriptive cross-sectional study

2.2. Setting and Sample of the Study

- **Place and Sample**

The research data were collected from Dhi Qar Specialized Center for Diabetes and Endocrinology from July 5th, 2022, to August 24th, 2022 in Dhi Qar, Iraq. The study population consisted of 450 patients who were over the age of 60 years old and currently suffering from diabetes mellitus type 2, The study sample size was 208 patients, with a 95% confidence interval and 5% margin of error. The sample was selected using a purposeful sample.

- **Inclusion criteria of sample**

1. Elderly patients with DM type 2 from both genders, at age 60 years old and above,

2. Patients who agreed to participate in the study

- **Exclusion Criteria of sample**

1. Patients who did not agree to participate in the study

2. Patients with DM type 1 and gestational DM

3. Patients who were suffers from hearing, vision, and talking problems.

4. Patients who were suffers from psychological and mental problems.

2.3. Study Instrument

Research data were collected using a questionnaire composed of two parts

Socio-demographic form: This part consists of 17 items related to socio-demographic information about elderly patients, namely age, gender, marital status, smoking, level of education, job, who they lived with, chronic disease, time since diagnosis, family history of diabetes, regular exercise, regular walks, place of residence, Body Mass Index (BMI), (HbA1C), Fasting Blood glucose (FBG), Post-prandial blood glucose (PBG). This questionnaire was designed by the researchers using the relevant literature (Fottrell *et al.*2018; Bukhsh *et al.* 2019; Kutbi *et al.* 2018; Alemayehu *et al.* 2020).

Michigan Diabetes Knowledge Test (V.2016) Arabic Version: This is a 14-item instrument designed to assess patient knowledge of diabetes type 2 concerning diet, exercise, blood glucose levels, and testing and self-care activities (Alhaiti et al., 2016).

2.5. Validity and Reliability

The Arabic version achieved outstanding results in terms of the test-retest reliability of the instrument with a mean of 0.90 intraclass correlation coefficient. It scored 0.75 for internal consistency via Cronbach's alpha test. Additionally, it had a high content validity score. For all instrument scales, the item-level content validity index ranged from 0.83 to 1, with a mean scale-level index of 0.96. The Arabic version has been shown to be a trustworthy and accurate test of patients' knowledge, which is prepared for use in clinical settings (Alhaiti *et al*. 2016) (Table 2.1).

In addition, we calculated Cronbach's alpha value for current study after we finished the study, and we found it to be 0.607 (Table 2.1).

Table 2.1: Cronbach's alpha test between Arabic version scale and current study

	Cronbach's alpha test
Study by Alhaiti *et al.* 2016	0.75
Current study	0.607

2.6. Ethics Committee Approval

The study was carried out between September 2021 and September 2022 with the aim of assessing the diabetes knowledge in elderly patients with type 2 diabetes in Iraq. The process began with the submission of the thesis proposal to the Institute of Health Sciences of Çankırı Karatekin University in September. After the subject of the thesis was accepted by the institute, an application was submitted to the Ethics Committee in October. It was approved by the Ethics Committee of Turkey in Meeting Decision Number: 24, dated: December 27th, 2021.

After ethical approval of the ethics committee of Çankırı Karatekin University was obtained, approval was obtained from the Dhi-Qar health director to facilitate the data gathering in the Dhi-Qar Specialized Center for Diabetes and Endocrinology.

The research was performed at the Dhi-Qar City Health Department /Training and Human Development. At the outset, permission was obtained from the Dhi-Qar Specialized Center for Diabetes and Endocrinology in Al Nasiriya City number: 1762022, dated: July 5th, 2022, where the study was conducted and the data was obtained.

The researcher explained the study and the objectives to the sample then asked them to give their consent to participate in the study. Then the gathering of data was started.

Permission was obtained by gmail message from the author developing the Michigan Diabetes Knowledge Test (V.2016) Arabic Version to use this scale (Alhaiti et al., 2016).

2.7. Data Collection

The process of gathering information was conducted between July 5th, 2022 and August 24th, 2022) in the Dhi Qar Specialized Center for Diabetes and Endocrinology. The study and it is objectives were explained to the study sample by the researcher , and consent was obtained from the study participants. Data was collected by interview. The questions were answered by the study participants without the researcher's intervention in their answers. The investigator gathered the data from the participants in the study by self report. The process of data collection took about 20 -25 minutes.

2.8. Data Analysis

The data were evaluated in the statistical package program of IBM SPSS Statistics Standard Concurrent User V. 26 (IBM Corp., Armonk, New York, USA). Descriptive statistics were given as a number of units (n), percentage (%), median (M), and interquartile distance (IQR). The distribution of the data from the scales was evaluated with the Shapiro Wilk test of normality. The internal consistency of the scale was evaluated with the Cronbach's alpha coefficient. Scale scores were compared with the Mann-Whitney U test when the number of groups was two, and with the Kruskal-Wallis H test when the number of groups was more than two. If the Kruskal-Wallis H test result was found to be significant, the Dunn-Bonferroni test was used as a multiple comparison test. The $p<0.05$ value was considered statistically significant in all comparisons.

2.9. Power Analysis of Coefficient Alpha: One Group

Table 2.2: Power analysis

Power	Sample Size (N)	Number of Items (K)	Coefficient Alpha|H1 (CA1)	Coefficient Alpha|H0 (CA0)	Signif. Level (Alpha)	(Beta)
0.78977	194	14	0.25000	0.00000	0.05000	0.21023
0.79172	195	14	0.25000	0.00000	0.05000	0.20828
0.79365	196	14	0.25000	0.00000	0.05000	0.20635
0.79557	197	14	0.25000	0.00000	0.05000	0.20443
0.79747	198	14	0.25000	0.00000	0.05000	0.20253
0.79936	199	14	0.25000	0.00000	0.05000	0.20064
0.80123	200	14	0.25000	0.00000	0.05000	0.19877

A sample of 200 subjects each responding to 14 items achieves 80% power to detect the difference between the coefficient alpha under the null hypothesis of 0.00000 and the coefficient alpha under the alternative hypothesis of 0.25000 using a two-sided F-test with a significance level of 0.05000.

2.9.1. Report Definitions

Power is the probability of rejecting a false null hypothesis.

N is the total sample size.

K is the number of items or raters.

CA1 is the value of coefficient alpha at which the power is computed.

CA0 is the value of coefficient alpha under the null hypothesis.

Alpha is the probability of rejecting a true null hypothesis. It should be small.

Beta is the probability of accepting a false null hypothesis. It should be small.

H0 is the null hypothesis that coefficient alpha equals CA0.

H1 is the alternative hypothesis that coefficient alpha does not equal CA0.

3. RESULT

Table 3.1: Demographic Characteristics of Participants (n=208)

Variables	Statistics *n* (%)
Age	
60-69 years	122 (58.7)
70 years and above	86 (41.3)
Gender	
Male	119 (57.2)
Female	89 (42.8)
Marital status	
Married	207 (99.5)
Unmarried	1 (0.5)
Smoking	
Yes	76 (36.5)
No	132 (63.5)
Educational status	
Literate	28 (13.5)
Primary school	23 (11.1)
Intermediate school	21 (10.1)
High school	51 (24.5)
University and Above	85 (40.9)
Job	
Working	93 (44.7)
Retired	115 (55.3)
Who do you live with?	
With family	208 (100.0)
Income satisfaction	
Satisfied	92 (44.2)
Somewhat satisfied	98 (47.1)
Not atisfied	18 (8.7)
Do you have any other chronic diseases?	
Yes	169 (81.3)
No	39 (18.8)

%: Percentage

Table 3.1: Demographic Characteristics of Participants (continued)

Variables	Statistics *n* (%)
Time since diagnosis	
Less than 1 year	17 (8.2)
Less than 5 years	43 (20.7)
More than 5 years	148 (71.2)
Family history of diabetes	
Yes	177 (85.1)
No	31 (14.9)
Do you exercise regularly?	
Yes	14 (6.7)
No	194 (93.3)
Do you take regular walks?	
Yes	44 (21.2)
No	164 (78.8)
Body Mass Index (BMI)	
Underweight	16 (7.7)
Normal weight	59 (28.4)
Overweight	72 (34.6)
Obese	61 (29.3)
Residence	
Rural	56 (26.9)
Urban	152 (73.1)
HbA1C	
Normal	9 (4.3)
Low	61 (29.3)
High	138 (66.3)
Fasting Blood Glucose (FBG)	
Low blood glucose	14 (6.7)
Normal	113 (54.3)
High blood glucose	81 (38.9)
Post Prandil Blood Glucose (PBG)	
Normal	76 (36.5)
High blood glucose	132 (63.5)

%: Percentage

According to Table 3-1, 208 participants took part in the study, and 122 of the participants (58.7%) were between the ages of 60 and 69. The number of male participants was 119 (57.2%). The number of married participants was 207 (99.5%), the number of non-smokers was 132 (63.5%), and 85 (40.9%) participants were university and above graduates. The number of retirees was 115 (55.3%). All of the participants live with their families, and 92 of the participants (44.2%) stated that they were satisfied with their income. The number of patients with an additional chronic disease other than diabetes was 169 (81.3%), and 148 of the participants (71.2%) had been living with the disease for more than 5 years. The number of patients with diabetes in their family history was 177 (85.1%). Was found that 194 (93.3%) of the participants did not exercise regularly, and 164 (78.8%) did not walk regularly. The body mass index values of 72 (34.6%) patients were recorded as overweight, and 152 (73.1%) of the participants live in urban areas. The number of patients with an HbA1C value in the diabetes group was 138 (66.3%). The number of patients with a normal FBG value was 113 (54.3%). The number of patients with RBG value high blood glucose was 132 (63.5%).

Table 3.2: Comparison of Knowledge Score and Demographic Characteristics

	Knowledge Level Total Score *M* (*IQR*)	Test Value	*p* Value
Age			
60-69 years	8.5 (4.0)	*z*=1.868	0.062
70 years and above	9.0 (4.0)		
Gender			
Male	9.0 (4.0)	*z*=1.998	**0.046**
Female	9.0 (4.5)		
Smoking			
Yes	9.0 (5.0)	*z*=1.061	0.289
No	9.0 (4.0)		
Educational status			
Literate	6.0 (3.0)[a]	*H*=49.338	**<0.001**
Primary school	5.0 (4.0)[a]		
Intermediate school	8.0 (4.0)[a]		
High school	9.0 (3.0)[b]		
University and above	10.0 (3.0)[c]		

M: Median, *IQR*: Inter Quartile Range, *z*: Mann Whitney U test, *H*: Kruskal Wallis test

Table 3.2: Comparison of Knowledge Score and Demographic Characteristics (continued)

	Knowledge Level Total Score *M* (*IQR*)	Test Value	*p* Value
Job			
Working	8.0 (4.0)	*z*=1.137	0.255
Retired	9.0 (4.0)		
Income satisfaction			
Satisfied	9.0 (4.7)	*H*=1.667	0.435
Somewhat satisfied	9.0 (5.0)		
Not satisfied	8.0 (2.7)		
Do you have any other chronic diseases?			
Yes	9.0 (4.0)	*z*=0.163	0.870
No	9.0 (5.0)		
Time since diagnosis			
Less than 1 year	8.0 (5.5)	*H*=5.046	0.080
Less than 5 years	8.0 (4.0)		
More than 5 years	9.0 (4.0)		
Family history of diabetes			
Yes	9.0 (5.0)	*z*=0.392	0.695
No	9.0 (3.0)		
Do you exercise regularly?			
Yes	8.0 (4.2)	*z*=1.139	0.255
No	9.0 (4.2)		
Do you take regular walks?			
Yes	8.0 (3.0)	*z*=0.574	0.566
No	9.0 (4.7)		
Body Mass Index (BMI)			
Underweight	10.0 (3.5)		
Normal weight	8.0 (4.0)	*H*=4.597	0.204
Overweight	9.0 (4.0)		
Obese	9.0 (3.5)		
Residence			
Rural	9.0 (2.7)	*z*=2.144	**0.032**
Urban	8.0 (5.0)		

M: Median, *IQR*: Inter Quartile Range, *z*: Mann Whitney U test, *H*: Kruskal Wallis test

Table 3.2: Comparison of Knowledge Score and Demographic Characteristics (continued)

	Knowledge Level Total Score *M* (*IQR*)	Test Value	*p* Value
HbA1C			
Normal	11.0 (2.5)[a]	*H*=9.770	**0.008**
Low	10.0 (4.0)[a]		
High	8.0 (4.0)[b]		
Fasting Blood Glucose (FBG)			
Low blood glucose	8.5 (6.0)[ab]	*H*=6.139	**0.046**
Normal	8.0 (4.0)[b]		
High blood glucose	9.0 (4.0)[a]		
Post Prandil Blood Glucose (PBG)			
Normal	8.0 (4.7)	*z*=3.807	**<0.001**
High blood glucose	9.0 (4.0)		

M: Median, *IQR*: Inter Quartile Range, *z*: Mann Whitney U test, *H*: Kruskal Wallis test

According to Table 3-2, the level of knowledge in the age different groups was statistically similar. The level of knowledge in men was higher than in women. Knowledge levels did not differ according to smoking status. The level of knowledge in patients with a university first degree or higher was statistically higher than in others. The level of knowledge was statistically similar according to working status, income status, having any chronic disease, disease duration, family history of diabetes, regular exercise, regular walking, and body mass index. The level of knowledge among patients living in rural areas was statistically high. Patients with normal HbA1C values had higher knowledge levels than others. The knowledge level of patients with an FBG value of high blood glucose was higher than others. The knowledge level of patients with an PBG value of high blood glucose was statistically higher than those with normal PBG values.

4. DISCUSSION

In a study conducted in India, participants' ages ranged from 35 to 85, with an average age of 55. Among the participants, 219 (71.3%) had moderate knowledge (Chavan *et al.* 2015), and this result is consistent with the current study. In the current study, 75% were found to have an acceptable diabetes knowledge level. In that same study, there was no association between age and knowledge (Chi-square = 5.47, P = 0.49) (Chavan *et al*. 2015). In the current study, the level of knowledge in the different age groups was statistically similar. That is, there were no differences in knowledge between age groups. We think that this is because the elderly people in Iraq had one or more chronic diseases, and T2DM was one of them.

In a study conducted in Ethiopia, males had more diabetes knowledge than females. (adjusted odds ratio = 1.62; 95% confidence interval: 1.05, 2.48) (Alemayehu *et al.* 2020). In the present study, the level of knowledge in men was higher than in women, and this is consistent with the previous study. We attribute the reason for men's knowledge of diabetes to the fact that Iraqi society is an Arab society that has customs and traditions which are closed like any Eastern society, and this negatively affected females due to a lack of communication with others and thus a limited knowledge of T2DM.

In the present study, we found that the level of knowledge of patients with a university first degree and above was statistically higher than that of others. In a study conducted in Bangladesh, after controlling for socioeconomic level and diabetes incidence, the gender gap in knowledge was shown to be statistically insignificant. It has been shown that knowledge decreases with aging but increases with academic attainment. (Fottrell *et al.* 2018). The result of the current study is in agreement with the study conducted in Bangladesh.

In the present study, we found that the level of knowledge of patients living in rural areas is statistically high. In another study conducted in Egypt, 499 (66.3%) out of a total of 750 participants were rural residents, and 251 (33.5%) were urban residents.

Higher levels of knowledge with highly statistically significant differences were reported among urban patients (90.8%), and logistic regression analysis revealed that the significant independent predictor of good knowledge regarding diabetes was in urban residents (OR=5.7) (El-Khawaga & Abdel-Wahab 2015). The result of the current study does not agree with the study conducted in Egypt. We think that the reason for this is that the rural population in Iraq tends to use the government health sector more than the private health sector represented by private medical clinics, because the government health sector provides free services and opens in the morning, in contrast to the private health sector, which is expensive, and also the medical clinics in Iraq open in the afternoon rather than in the morning, and the majority of the study sample resided in rural areas.

In a study conducted in Pakistan, it was found that diabetes knowledge was not significantly associated with the duration of diabetes (*p*-Value = 0.18) (Bukhsh *et al.* 2019). In the current study, the level of knowledge was not statistically significant according to the duration of diabetes (*p*-Value = 0.080). The result of the current study is in agreement with the study conducted in Pakistan.

In a study conducted in Bangladesh, knowledge of diabetes was significantly associated, with a family history of diabetes (Islam *et al.* 2015).In another study conducted in Nepal, a significant relationship existed between diabetic knowledge questionnaire (DKQ) score and family history of diabetes. (Shrestha *et al.* 2015). This was not found in the current study. In the present study, we found that the level of knowledge was not statistically significant according to family history of diabetes (*p*-Value = 0.695). We attribute the absence of differences in the level of knowledge between patients who had a family history of diabetes and those who did not have a family history of diabetes to the fact that the first question circulating about diabetes in Iraq is whether there is a family history of diabetes, and this may expand the base of that information.

In a study conducted in Saudi Arabia, on diabetes knowledge and its association with weight. weight status was significantly associated with general knowledge about

diabetes (p-Value = <0.01) (Kutbi *et al.* 2018). But this was not found in the current study. We found that the level of knowledge was not statistically significant according to body mass index (p-Value = 0.204). We think that the reason for the existence of statistical similarity in the body mass index is that the majority of the study sample were aware that obesity is one of the most important risk factors for diabetes, which is confirmed by our study, as patients who are [overweight 72 (34.6)] and those who have [obesity 61 (29.3)] of all participants.

In a study conducted in Pakistan, diabetes knowledge was significantly related to glycated hemoglobin ($r=-0.62$. $p<0.001$). People with diabetes who had good glycemic control (HbA1c<7%) scored significantly higher ($p<0.001$) for diabetes knowledge (Bukhsh *et al.* 2019). In the current study, we found that patients with normal HbA1C values had higher knowledge levels than others The result of our study agrees with the result of the previous study.

In a study conducted in Indonesia, the result showed statistically that there was a significant correlation ($\alpha=0.001$, $p<0.05$) between the knowledge level of DM management and the pre-prandial glucose levels (Fasting Blood Glucose) in respondents with a coefficient correlation of 0.422 (Haris & Kristianti 2020). In another study conducted in Indonesia, there was no significant relationship between knowledge of diabetes and the value of fasting blood glucose p value = 0.145 (α = 0.05). (Prasetyo 2020). In the current result, we found that the level of knowledge of patients with a high bloog glucose FBG value was higher than the knowledge of others. We attribute this to the fact that the main vital indicator for diagnosing diabetes is high fasting blood glucose. This result confirms our study that the majority of the study sample had a family history of diabetes with a percentage of 177 (85.1), which expanded the knowledge base about their diabetes.

In a study conducted in south India, no clear relationship between RBS levels and diabetic knowledge could be computed because RBS values do not provide unbiased results when compared to HbA1c% . In the majority of the study population, a massive 45.25% had RBS values greater than 200mg/dL, while 33.75% had values ranging

from 140 to 200mg/dL (Basker *et al.* 2016). In the current result, we found that the knowledge level of patients with an PBG value of high blood glucose is statistically higher than those with normal PBG values. We think the reason for this is the continuous rise in the post-prandil blood glucose (PBG) that elderly patients experience after eating and the frequent recurrence of this condition in these patients has increased their knowledge about DM and the mechanism of controlling high blood glucose and reaching the normal level, and that this was confirmed by our study, which shows that patients with PBG in their blood have more knowledge of diabetes than normal PBG.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

According to the study findings, the level of diabetes knowledge was higher in men, those with higher education levels, and those living in rural areas. The level of diabetes knowledge was higher in those who could keep their HbA1C levels within the normal range and those with high fasting and postprandial blood glucose.

5.2. Recommendations

Based on the above list of conclusions, the study recommends that:

1. Controlling diabetes in elderly patients is complicated for caregivers since it might be difficult to individualize glycemic objectives, treatment plans, coexisting comorbidities, polypharmacy, and hypoglycemia risk.

2. Increase elderly diabetes knowledge by arranging educational programs.

3. Create accessible and acceptable self-care strategies for all elderly diabetic patients.

4. Conduct further specialized research in the field of elderly diabetes mellitus patients' knowledge.

5. Develop individual and group education plans to help prevent and manage diabetes by using programs and seminars held in diabetes centers and primary care centers for the elderly.

6. Extend an invitation to hold seminars and conferences for elderly women with diabetes as part of women’s rights programs that are set up by civil society

organizations to care for women's rights, through which the mechanism of diabetes and methods of treatment and prevention are presented. This will increase the knowledge of older women about diabetes, provided that it is presented through the media as part of the dissemination of that knowledge.

7. Make a health commitment to patients with diabetes, which is a health problem that imposes a heavy burden on the healthcare systems of the countries of the world in general and Iraq in particular, given the high financial cost of non-compliance, in addition to the serious complications. The issue of health compliance has become one of the priorities of the health systems of countries, and we can define health compliance as the extent to which the patient's behavior is compatible with the recommendations of the treating team, such as commitment to taking medications, following a diet, and exercising. As there are several factors that affect it, including those related to the patient and disease, and the social and economic situation, we seek to enhance patients' commitment to treatment through various strategies which can be employed by health care providers, such as increasing patients' awareness of the complications of diabetes and the available treatments, enhancing their self-confidence and their ability to follow treatment, and training them in self-care and managing their disease, simplifying treatment and educating patients' families and their surroundings about the importance of further support In the end, we can say that health adherence is not a problem that patients are responsible for, but that the entire treating team of health care providers, in addition to patients' families and the media as a whole, must work to raise the level of health commitment in patients to avoid complications of diabetes in the elderly and reduce the cost of health care, especially in the case of diabetes due to its large spread, which constitutes a health dilemma that calls on those responsible for the health system to reconsider the preventive and curative strategies used.

8. Hold courses to educate elderly people with diabetes about the HGA1C test and its importance for early control and management of diabetes, with emphasis on the importance of conducting this test on a regular basis, which would increase the knowledge of the elderly about this test and thus achieve diabetes control.

9. Increase knowledge of diabetes through conducting field awareness campaigns that include meeting with families and providing awareness programs about diabetes, its symptoms, causes, risk factors, methods of treatment, and prevention.

10. Elderly Iraqis need the support of their community and culture to make strides in eliminating diabetes. Social variables may have a significant role in determining obesity, physical activity, cognitive function, risk perception, and change effectiveness. The causes of diabetes and its co-morbidities need to be better understood, especially in the aged population. Future research must focus on developing knowledge in diabetes care.

11. The research supports the idea that enhancing all older diabetics' knowledge, compliance, and disease management through the provision of appropriate healthcare and extensive educational campaigns is the primary way to solve this problem.

12. Establishing educational programs about diabetes and its management that are easily accessible through social media is one of the means of disseminating knowledge.

13. Supporting interdisciplinary and intersectoral cooperation, ensuring proper quality of diabetic nursing care and adequate use of new technologies, restructuring, refocusing, and reinforcing basic diabetic nursing education; involving individuals, families, and communities in diabetic care activities, and enabling them to take more responsibility for their health. Nursing and midwifery professionals can take advantage of numerous education opportunities related to diabetes, allowing them to increase their depth of knowledge, broaden their scope of practice, and better collaborate with other professionals in a healthcare setting.

14. As a result, governments in Iraq have a great responsibility to make and implement the necessary arrangements in their public health policies. In addition, health professionals have great responsibilities.

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GENİŞLETİLMİŞ TÜRKÇE

Giriş: Nüfus yaşlandıkça, diyabet gelişme riski de artmaktadır. Diyabetle ilgili tıbbi harcamaların 2017 yılında dünya çapında 727 milyar dolar olduğu tahmin edilmektedir. Hastalık Kontrol ve Önleme Merkezlerine (CDC) göre. Irak, güvenlik durumu kötüleşen Arap ülkelerinden biridir bu da sağlanan sağlık hizmetlerinin gerçekliğine ve dolayısıyla diyabet hastası yaşlı hastalara yansımaktadır.

Irak, 2020 ile 2050 yılları arasında 60 yaş ve üzeri insan sayısının 2 milyondan 7,5 milyona dört kat artmasıyla birlikte demografik bir değişim yaşayacağı öngörülmektedir MENA bölgesindeki tüm ölümlerin yarısından fazlası diyabete bağlanmaktadır, zira Irak, tip 2 diyabet prevalansının en yüksek olduğu ülkelerden biridir.

Uluslararası Diyabet Federasyonu'nun yaptığı bir araştırmaya göre 2025 yılına kadar diyabet hastalarının sayısı 330 milyonu aşacaktır. Diyabetli nüfusun büyük bir kısmını 65 yaş üstü kişiler oluştururken her toplum, insanlar yaşlandıkça diyabet insidansında bir artış görmekte ve en yaşlı yaş gruplarında en sık görülmektedir. Diyabet, sağlık sistemi üzerindeki yüksek maliyeti ve finansal yükü nedeniyle kritik bir sorundur. Irak'ın sağlık sistemi, ülkenin yaşlanan nüfusunun taleplerini karşılamak için değişmelidir.

Tip 2 diyabetli hastalar, hastane üzerindeki yükü azaltırken bağımsızlıklarını korumalarına izin veren öz bakım önlemlerinden yararlanabilmektedir. Yaşlılar arasında sağlık hizmetlerini teşvik ederek diyabet hakkındaki bilgilerin değerlendirilerek yaşlıların diyabet hakkında ne kadar bilgiye sahip olduklarına ilişkin bilgi tabanını genişletebilmektedir. Bu çalışma, diyabetli yaşlıların diyabetle ilgili becerilerini ve demografik değişkenler ile diyabeti anlama arasındaki ilişkiyi değerlendirmeyi amaçlamış olup Irak'ta yapılan ilk çalışmadır.

Yöntem: Tanımlayıcı kesitsel bir çalışma olan araştırma verileri, Irak'ın Dhi Qar kentindeki (5 Temmuz 2022- 24 Ağustos 2022) tarihleri arasında (Dhi Qar Diyabet ve Endokrinoloji İhtisas Merkezi) 'nden toplanmıştır. Çalışma örneklem büyüklüğü (60) yaşın üzerinde olan ve diabetes mellitus tip 2'den muzdarip (208) hasta idi. Örneklemin dahil edilme kriterleri, her iki cinsiyetten, 60 yaş ve üstü DM tip 2 olan ve çalışmaya katılmayı kabul eden yaşlı hastalardı. Örneklemin dışlama Kriterleri, çalışmaya katılmayı kabul etmeyen hastalar ve DM tip 1 ve gebelik dm'si olan hastalar idi. Çalışmanın aracı, veri toplama aracı olarak Arapça Versiyonda sosyo-demografik form ve Michigan Diyabet Bilgi Testi (V.2016) olmak üzere iki bölümden oluşmaktadır. Yüz yüze görüşme yöntemi kullanılarak toplanan veriler; Veri toplama işlemi yaklaşık 20-25 dakika sürmüş, Analiz için Mann-Whitney U testi ve Kruskal-Wallis H kullanılmıştır.

Sonuç: 122 katılımcının (%58.7) (60-69) yaşları arasında olduğunu gösterilmektedir. Erkek katılımcı sayısı (%57.2) olarak 119'dur. Evli katılımcı sayısı ise (%99.5) olarak 207 idi. 85 (%40.9) katılımcının lisans ve üzeri eğitim düzeyi vardır. Emekli sayısı (%55.3) olarak115'tir. Katılımcıların 152'si (%73.1) kentsel alanlarda yaşamaktadır. Diyabet grubunda HbA1C değeri olan hasta sayısı (%66.3) olarak 138 idi. Ortalama FBG değeri olan hasta sayısı (%54.3) olarak 113 idi. PBG değeri yüksek kan glukoz olan hasta sayısı 132 (%63.5) idi.

Erkek cinsiyet, üniversite ve üzeri eğitim durumu, kırsal yerleşim yeri, HbA1C (Diyabet), yüksek kan glukoz açlık kan glukozi (FBG), yüksek kan glukoz yemek sonrası kan glukozi (PBG) bilgi düzeyleri bilgi düzeyi ile istatistiksel olarak anlamlıdır. (P-Değeri 0.05). Ancak uzmanlık öyküsü, yaş, sigara, iş, gelir memnuniyeti, diğer kronik hastalıklar, tanı zamanı, ailede diyabet öyküsü, egzersiz, düzenli yürüyüşler ve vücut kitle indeksi (VKİ) açısından istatistiksel olarak anlamlı değildir.

Bulgu: Araştırma bulgularına göre erkeklerde, eğitim düzeyi yüksek olanlarda ve kırsal kesimde yaşayanlarda diyabet bilgisi daha yüksekti. HbA1C düzeylerini normal

aralıkta tutabilenler ile açlık ve tokluk kan şekeri yüksek olanlarda diyabet öğrenme öyküsü daha yüksekti.

Öneriler: Diyabet, birlikte var olan komorbiditeler, polifarmasi ve hipoglisemi riski nedeniyle yaşlılarda tedavisi veya yönetimi zor bir hastalıktır. Sivil toplum kuruluşları tarafından oluşturulan kadın hakları programları kapsamında diyabetli yaşlı kadınlara yönelik seminer ve konferanslar düzenlenme daveti, yaşlı kadınların diyabet hakkındaki bilgilerini artıracaktır. Sağlığa uyum konusu, birçok ülkenin sağlık sistemlerinin önceliklerinden biri haline gelmiştir. Hasta ve hastalıkla ilgili olanlar ve sosyal ve ekonomik durumla ilgili olanlar da dahil olmak üzere çeşitli faktörler onu etkilemektedir. Sağlığa bağlılığın hastaların sorumlu olduğu bir sorun olmadığını, ancak tüm sağlık hizmeti sağlayıcıları ekibinin hastalardaki bağlılık seviyesini yükseltmek için çalışması gerektiğini söyleyebiliriz.

Yaşlı Iraklılar, diyabetin ortadan kaldırılmasında adımlar atmak için toplumlarının ve kültürlerinin desteğine ihtiyaç duymaktadırlar. Diyabetin nedenleri ve yandaş hastalıkları, özellikle yaşlı popülasyonda daha iyi anlaşılmalıdır. Irak'taki hükümetler, halk sağlığı politikalarında gerekli düzenlemeleri yapmak ve uygulamak için büyük bir sorumluluğa sahiptir.

APPENDICES

Appendix A. Ethical approval from the Çankırı Karatekin Ünıversitesi

Appendix B. Ethical approval from Iraq

Appendix C. Approval from the developer of the Arabic version of the search tool

Appendix D. Data Collection Form in English

Part1: Socio-demographic characteristics :

Part2: Michigan Diabetes Knowledge Test (V.2016) in Arabic Version

Appendix E. Data Collection Form in Arabic

الجزء الأول: الخصائص الاجتماعية والديموغرافية:

الجزء الثاني: اختبار ميتشيغان المعرفي لمرض السكري (النسخة الخامسة 2016) في النسخة العربية

Appendix F. Certificate of English editing

CURRICULUM VITAE

Personal Information

Name and Surname : Aqeel Ali YASEEN
Data of Birth
Place of Birth
Marital Status
Nationality
Phone Number
E-mail

Education Qualification

Work Experience

Year	**Institution**	**Position**

Languages