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ASSESSMENT OF NURSES' KNOWLEDGE CONCERNING TYPE 2 DIABETES MELLITUS MANAGEMENT WITH INSULIN THERAPY IN WASIT PROVINCE HOSPITALS / IRAQ.

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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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ACCEPTANCE AND APPROVAL

Alaa Hasan Abdullah AL-MUNTAFEKY the graduate student of The Institute of Health Sciences with the student number of 208205267, has successfully presented her thesis entitled Assessment of Nurses Knowledge Concerning Type 2 Diabetes Mellitus Management with Insulin Therapy in Wasit Province hospitals / 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 Nurses Knowledge Concerning Type 2 Diabetes Mellitus Management with Insulin Therapy in Wasit Province hospitals / Iraq which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, 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 used sentences and interpretations within the work belongs to me.

I declare the aforementioned issues to be correct.

Signature

/ /

Alaa hasan Abdullah AL-MUNTAFEKY

ABSTRACT

ASSESSMENT OF NURSES KNOWLEDGE CONCERNING TYPE 2 DIABETES MELLITUS MANAGEMENT WITH INSULIN THERAPY IN WASIT PROVINCE HOSPITALS / IRAQ

Alaa Hasan Abdullah AL-MUNTAFEKY

Master of Science in Nursing

Advisor: Assoc. Prof. Dr. SONGÜL ŞAHİN

February 2023

Objective: This research aims to evaluate and compare the knowledge of nurses working in Cardiopulmonary resuscitation, pulmonary resuscitation, and surgical wards for diabetic foot care for diabetic patients who require surgical intervention in hospitals in Wasit Province /Iraq, regarding diabetes management from Type II and insulin therapy.

Methodology: A cross-sectional descriptive study was conducted in Al-Karama Teaching Hospital and Al-Zahra Teaching Hospital in Wasit Province in Iraq from 01.04.2022 to 31/12/2022. The research includes participants who were nurses and the number of samples was (60) nurses formed from all nurses who provide insulin treatment for type 2 diabetes (DM) patients according to special criteria Data were collected by applying direct interviews as a method of face-to-face data collection. Nurses' knowledge was used to collect data.

Results: the statistical analysis showed that the mean age in the study was 35.7 ± 10.8 and that 60.0% of the males from the study group were 20-50 years old. A significant relationship was determined between gender, experience, department, and educational level, there was a significant correlation between the department and knowledge of diabetes, and no significant between age, education level, years of experience, and knowledge of diabetes, and there was no significant relationship between nurses with knowledge of diabetes. The practice and knowledge at males were higher than females, and the Knowledge was associated with practices.

Conclusion: The results of the study showed that the knowledge and attitudes of the nurses participating in the study about type 2 diabetes among the nursing staff were

good knowledge. meaning that there is a strong relationship between knowledge and diabetes and that knowledge positively affected the treatment and prevention of diabetes.

2023, 85 pages

Keywords: Nurse Knowledge, hospitals, Insulin Therapy, Assessment.

ÖZET

Hemşirelerin Irak Wasit İl Hastanelerinde İnsülin Tedavisi İle Tip 2 Diyabet Tedavisine İlişkin Bilgilerinin Değerlendirilmesi

Alaa hasan Abdullah AL-MUNTAFEKY

Hemşirelik, Yüksek Lisans

Tez Danışmanı: Doç. SONGÜL ŞAHİN

Şubat 2023

Amaç: Bu araştırma, Irak'ın Wasit Vilayeti'ndeki hastanelerde cerrahi müdahale gerektiren diyabetik hastaların Kardiyopulmoner resüsitasyon, pulmoner resüsitasyon ve diyabetik ayak bakımı cerrahi servislerinde çalışan hemşirelerin Tip II ve insülin tedavisi.

Metodoloji: Irak'ın Wasit Eyaletindeki Al-Karama Eğitim Hastanesi ve Al-Zahra Eğitim Hastanesinde 01.04.2022 - 31/12/2022 tarihleri arasında kesitsel tanımlayıcı bir çalışma yapılmıştır. Araştırma hemşire olan katılımcılardan oluşmaktadır ve örneklem sayısı tip 2 diyabet (DM) hastalarına insülin tedavisi veren tüm hemşirelerden özel ölçütlere göre oluşturulmuş (60) hemşiredir. Veriler yüz yüze görüşme yöntemi olarak doğrudan görüşme uygulanarak toplanmıştır. Veri toplamak için hemşirelerin bilgileri kullanılmıştır.

Bulgular: İstatistiksel analiz, çalışmadaki yaş ortalamasının 35,7 ± 10,8 olduğunu ve çalışma grubundaki erkeklerin %60,0'ının 20-50 yaşında olduğunu gösterdi. Cinsiyet, deneyim, bölüm ve eğitim düzeyi arasında anlamlı bir ilişki saptanırken, bölüm ile diyabet bilgisi arasında anlamlı bir ilişki saptanırken, yaş, eğitim düzeyi, deneyim yılı ve diyabet bilgisi arasında anlamlı bir ilişki saptanmamış ve diyabet bilgisine sahip hemşireler arasında anlamlı bir ilişki yoktur. Erkeklerde uygulama ve bilgi, kadınlara göre daha yüksekti ve Bilgi, uygulamalarla ilişkilendirildi.

Sonuç: Çalışmanın sonuçları, çalışmaya katılan hemşirelerin hemşireler arasında tip 2 diyabet ile ilgili bilgi ve tutumlarının iyi düzeyde olduğunu göstermiştir. bilgi ve diyabet arasında güçlü bir ilişki olduğu ve bu bilginin diyabetin tedavisini ve önlenmesini olumlu yönde etkilediği anlamına gelir.

2022, 85 sayfa

Anahtar Kelimeler: hemşire bilgisi, hastaneler, insülin tedavisi, Değerlendirme.

PREFACE AND ACKNOWLEDGEMENTS

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Alaa hasan Abdullah AL-MUNTAFEKY

Çankırı-2022

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N	Number
%	Percentages
μ	mean
F	frequency
P-value	Probability
S.d	standard deviation

LIST OF ABBREVIATIONS

CPR	Cardiopulmonary resuscitation
DM	Diabetes Mellitus
WHO	World Health Organization
CVD	cardiovascular disease
PVD	Peripheral Vascular Disease
IDDM	Type One Diabetes Mellitus
NIDDM	Type Two Diabetes Mellitus
T2DM	Type Two Diabetes Mellitus
T1DM	Type One Diabetes Mellitus
HbA1c	Hemoglobin Glucose
IDF	International Diabetes Federation
DSN	diabetes specialist nurse
DSME	Diabetes Self-Management Education
ADA	American Diabetes Association
OGTT	Oral Glucose Tolerance Test
GDM	Gestational Diabetes Mellitus
GCT	Glucose Challenge Test
BMI	Body Mass Index
HTN	Hypertension
ZnT8	Zinc transporter 8
LD	linkage disequilibrium
HLA	Human leukocyte antigen
IBD	Inflammatory Bowel Disease
MI	Myocardial Infarction
BP	Blood Pressure
LADA	latent Autoimmune Diabetes in Adults
GBD	Global Burden of Disease
LDP	low density lipoprotein
SNPs	single nucleotide polymorphisms
CVD	Cardiovascular Disease
BCTs	Behavior Change Techniques
GPCR	G protein-coupled receptors
SPMs	Specialised Pro-resolving Mediators
DKA	Diabetic Ketoacidosis
HHS	Hyperosmolar Hyperglycemic Syndrome
AP	Acute Pancreatitis
AKI	Acute kidney injury
MAGE	Mean Amplitude of Glycemic Excursions
NAFLD	Non-Alcoholic Fatty Liver Disease
CAM	Complementary and Alternative Medicine
GFAP	Glial Fibrillary Acidic Protein

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1. INTRODUCTION

Diabetes is an important condition that has been recognized although it does not appear to be a common clinical or therapeutic focus. Over the past few decades, the prevalence of this disease has increased and has had a devastating impact on people's health and development (Roglic, 2016). High blood sugar levels and insufficient insulin production cause the cells to appear that characterize a group of metabolic diseases known as diabetes mellitus (DM) or just diabetes mellitus (Deshmukh, C. D., Jain, A., & Nahata, 2015).

Evidence, as well as data from the International Diabetes Federation (IDF), show that the MENA region has the highest rates of individuals with diabetes (Somappa et al., 2014). Estimates say diabetes will triple between 2015 and 2040, making diabetes a major public health problem worldwide despite widespread ignorance of the condition (Ogurtsova et al., 2017). Over the past three decades, the incidence of diabetes has increased dramatically, making it one of the most pressing global health concerns for the World Health Organization (Chen et al., 2012). On April 7, 2016, World Health Day, a day dedicated to drawing attention to health issues, the first World Health Organization report on diabetes was published. In addition, the 2011 high-level political meeting was one of the non-communicable diseases included in the presentation of the United Nations Political Declaration. and control of non-communicable diseases (Roglic, 2016).

The World Health Organization adopted a global framework in 2013 for monitoring noncommunicable diseases, with several targets being achieved by 2025 (Roglic, 2016). The goals and indicators largely reflect diabetes and primary risk factors, with no increase in the prevalence of diabetes and a decrease in exposure to an unhealthy diet and lack of physical activity (Roglic, 2016). The influence of factors such as genetic susceptibility and environment on preventive measures and environmental and societal factors in developing diabetes and increasing obesity in young adults (including children and adults) (Chen et al., 2012). High blood sugar in diabetic patients leads to

various diseases that pose a threat to health, which eventually leads to the death of the person with diabetes due to the many complications and health problems caused by diabetes (Abduelkarem & El-Shareif, 2013).

Complications from microvascular effects (eg, retinopathy, nephropathy, polyneuropathy) and macrovascular problems (eg, amputations, heart attacks, strokes) are of primary concern to diabetics due to hyperglycemia and some aspects of the syndrome. Insulin resistance (metabolic) (eg, cardiovascular) and comorbidities (DeFronzo et al., 2015). Achieving adequate metabolic control is essential to reduce the consequences of chronic diabetes, as HbA1c 7.0% has been indicated as a target for glycemic management (Scain et al., 2007).

The only thing that separates the patient from the disease and the donor from the patient is the specialist nurse (Markowitz et al., 2011). Various factors such as diabetes education, nursing education, and patient education from service provider may play important roles in decreasing the severity of disease problems (Scain et al., 2007). The way one thinks about oneself is critical to effective diabetes control (Mohebi et al., 2018). That patients have poor glycemic control due to lack of literacy and have more difficulty figuring out how to put what they have learned into practice in their daily lives Health education may be one of the most essential resources for this group (Hawthorne & Tomlinson, 1999).

Three primary diabetes kinds of diabetes that are traditionally recognized. People with type 1 diabetes, also known as IDDM, need to inject insulin or use an insulin pump in order to keep blood sugar levels under control. This condition is sometimes referred to as "juvenile diabetes" (Deshmukh, C. D., Jain, A., & Nahata, 2015). Type 2 diabetes, often called NIDDM, is a metabolic condition in which cells fail to use the hormone insulin properly and cannot use insulin adequately, regardless of whether or not there is an absolute lack of insulin. It was formerly known as "adult diabetes" (Deshmukh, C. D., Jain, A., & Nahata, 2015).

High blood sugar is a complication of Type 2 diabetes is a 21st-century health crisis The economic and personal toll it incurs, which causes more than 4 million victims annually, reduces life expectancy by about 15 years for those affected. This disease is a major public health concern worldwide (Mohebi et al., 2018). A growing concern worldwide is the rising incidence of type 2 diabetes associated with the current obesity crisis (DeFronzo et al., 2015). The most common form among children, adolescents and young adults is reflected in the complexity of the underlying causes that include genetic and epigenetic mechanisms that interact within a sociocultural framework influencing behavior and environmental consequences (Chen et al., 2012).

Other physiological disorders such as poor diet, lack of exercise, insulin resistance and insufficient insulin production are the main features of type 2 diabetes (DeFronzo et al., 2015). Evidence for the importance of treating type 2 diabetes with nutrients, foods and dietary patterns (Ley et al., 2014). Type 3 diabetes Pregnant women are at risk of developing the third form of diabetes, which is called gestational diabetes. who have never had diabetes (Deshmukh, C. D., Jain, A., & Nahata, 2015).

The treatment offered must include careful dissemination of current treatment modalities. This can only work if the patient has a specific profile in which changes in blood sugar, blood pressure, lipid profiles, physical activity, weight, knowledge, lifestyle, and ability can be attributed. The health of the individual has a protective effect (Scain et al., 2007). Several antidiabetic medications will be needed to maintain normal blood sugar levels. For treatment to be effective and tolerable, it must improve patients' well-being. The most urgent need is new drugs that increase insulin sensitivity, halt the progression of pancreatic cell loss and reduce or even reverse complications of microvascular disease (DeFronzo et al., 2015).

The proportions of fat and carbohydrates in an individual’s diet are more important than the total amounts of these large foods that an individual consumes. A diet entire grains, fruits, veggies, legumes, nuts including only a moderate amount of alcoholic beverages. By avoiding Refined carbohydrates, red/processed meat, sugary drinks you can A person can reduce the chances of developing diabetes (Ley et al., 2014).

Type 2 diabetics' blood glucose readings seek treatment in general primary care practices and secondary care clinics in health centers Hospitals may be influenced by the nurses' gender, educational background, and location of practice (Hawthorne & Tomlinson, 1999). However, both the patient and the healthcare provider may fail to take this into account because the vast majority of hospitalized patients are present for reasons unrelated to diabetes and as a result, there is an urgent need to enhance glycemic management in both newly diagnosed patients and those present. Already in the hospital (Abduelkarem & El-Shareif, 2013).

Despite the availability of modern drugs to treat this disease, millions of diabetics are more susceptible to life-threatening problems (Somappa et al., 2014). As a result, it is important to assess nurses' awareness levels regarding type 2 diabetes and to include previous and postgraduate studies and instructions to address any gaps.

1.1 Purpose of the study

It is to determine the level of knowledge and attitudes of nurses about type 2 diabetes, its causes, risk factors, complications and symptoms of type 2 diabetes.

1.2 Problem statement

The statement of problems can be summarized by the following question: -

What are the levels of knowledge and attitudes about type 2 diabetes?

1.3 Hypothesis of the study

H0: The nurses do not have sufficient skills about type 2 diabetes and how it is treated with insulin or not in hospitals and the diabetes care unit.

H1: There are sufficient skills and abilities of nurses working in Wasit Governorate hospitals / Iraq about type 2 diabetes and its treatment with insulin and good insulin injection sites for rapid absorption.

1.4 Limitations of this Study

The research is limited to the date it was conducted, the data collection form used for the purpose, and the answers given by the individuals.

2 GENERAL INFORMATION

2.1 An Overview of Diabetes Mellitus

Diabetes also known as (DM) is a group of chronic metabolic illnesses in which a person is involved in excessive levels of blood sugar due to either insufficient insulin production by the pancreas or ineffective insulin uptake or action by body cells Diabetes mellitus is one of the most prevalent endocrine diseases that impair the body's capacity to either make or use insulin Diabetes is a condition that can be further subdivided into diabetes types 1 and 2 Typically, increased hunger increased thirst, and increased frequency of urination are the symptoms of hyperglycemia (Mukhtar et al., 2020).

Hyperglycemia is a defining characteristic of the more general group of disorders known as diabetes mellitus Hyperglycemia can be caused by either a shortage, either absolute or relative, of insulin, either in terms of production or efficiency Chronic hyperglycemia is a complication of diabetes that has been linked to the failure, dysfunction, and destruction of organs The kidneys, the brain, and the cardiovascular system are all vulnerable to the effects of these problems According to estimates provided by the International Diabetes Federation (IDF), there are currently 366 million people in the world who are living with diabetes in 2011, and they projected that number to rise to 552 million people by the year 2030 (Alam et al., 2014).

People with type 1 insulin-dependent diabetes mellitus (IDDM) are required to take insulin by injection or through the use of an insulin pump at this time, this condition is also referred to as "juvenile diabetes" Insulin resistance occurs when cells are unable to utilize adequately Adequate insulin, regardless of whether there is an absolute lack of insulin resistance or not, is another name for non-insulin-dependent diabetes mellitus (NIDDM) which is an acronym for "non-insulin-dependent diabetes mellitus" In the past, individuals diagnosed with This form of type 3 diabetes (GDM) affects pregnant women who have never had diabetes and has the potential to develop into type 2 diabetes once the baby is born (Mukhtar et al., 2020).

Type 1 and type 2 diabetes are usually differentiated in terms of treatment based on the factors that led to the condition's development People who have a family history of the condition or who take certain medications at the same time, including corticosteroids, are at increased risk of developing hyperglycemia states Recent recommendations from the American Diabetes Association that screening for diabetes can be done with the HbA1c test or the two-hour oral glucose test (ADA) Observational studies conducted in intensive care settings have shown great importance The association between chronic and acute hyperglycemia and poor clinical outcome, however, strict hypoglycemia makes glycemic control controversial as well as the potential for increased morbidity and mortality Maintaining blood glucose levels in the range from 140 to 180 mg/dL (7.8 to 10.0 mmol/L) requires a continuous intravenous infusion of insulin to patients with severe conditions (Alam et al., 2014).

When diabetes mellitus is present, there is an increased likelihood of a number of complications, some of which include CVD, peripheral vascular disease, stroke, neuropathy, renal failure, retinopathy, blindness, and amputations amongst others Drugs, are typically utilized to treat symptoms and save lives Secondary objectives include the avoidance of diabetes complications over the long run and the extension of life expectancy through the mitigation of hazard Type-1 diabetics require insulin replacement therapy as the primary mode of treatment, in addition to dietary and lifestyle modifications Biguanides and sulfonylureas are simply two different types of hypoglycemic medicines that can be used to treat diabetes Biguanides are considered to be the most a key part of type 2 diabetes management None of these medications is perfect because each one has undesirable side effects and has the potential to produce less effective results with extended use The most significant disadvantage of the pharmaceuticals that are now on the market is that they have to be taken on a regular basis Lifelong impacts can be harmful Diabetes can be treated with medicinal plants and the bioactive components of those plants all over the world, but this is especially true in areas of the world that do not have access to conventional diabetes medications (Deshmukh, C. D., Jain, A., & Nahata, 2015).

Originally, there were just two different types of diabetes that were classified as type 1 diabetes, which is now known as childhood diabetes and type 2 diabetes, which is now known as adult diabetes This has already led to the identification of more than fifty different subcategories They are brought on by additional diseases and syndromes, or they are formed by a variety of mechanisms that are harmful Assessment of excess Plasma glucose levels after an overnight fast and/or a glucose load (OGTT) and, more recently, glycated hemoglobin levels are the three main stages in the diagnosis of diabetes The recognition of characteristic symptoms by a doctor and the detection of ambient hyperglycemia are now the two main stages in the diagnosis of diabetes (A1c) According to the results, prevalence of diabetes is significantly higher, and it has considerable detrimental impacts on overall health Recent research has shown that individuals who diabetes-prone and pregnant women who are carrying fetuses have a greater likelihood of experiencing morbidity and mortality (Cowie et al., 2018).

Type 1 diabetes mellitus (T1DM), often called autoimmune diabetes, is a chronic illness caused by the loss of pancreatic cells, culminating in hyperglycemia Symptoms usually emerge in childhood or adolescence, although sometimes later T-cell destruction may play a role in T1DM pathophysiology, however, the cause is unknown Autoantibodies targeting insulin, glutamic acid decarboxylase, insulin-binding protein, and zinc transporter were discovered months before symptom onset Proteins bind beta cell secretory granules It can discover T1DM risk factors First-generation autoantibodies are hereditary and environmental Depending on hyperglycemia and symptoms, the etiology of T1DM can be separated into three phases (eg frequent urination, thirst, and hunger) Patients remain dependent on insulin injections for the rest of their lives due to the lack of effective treatment; However, new insulin therapy technologies Insulin pumps, continuous glucose monitoring, and hybrid closed-loop systems are in development Despite rigorous glycemic treatment, most T1DM patients suffer severe repercussions Significant research efforts are needed to achieve early diagnosis, reduce beta cell loss, and provide better therapy options (Katsarou et al., 2017).

Diabetes type 2 is a significant challenge to one's health This metabolic condition is characterized by excessive blood glucose levels all over the world, which are brought on by inadequate production of insulin by the pancreas an inflammatory response is brought on by the immune system's reaction elevated blood glucose and inflammatory mediators from fat cells and macrophages in adipose tissue Both of these factors contribute to obesity This prolonged low-grade inflammation causes damage to pancreatic beta cells and also hinders the body's ability to produce sufficient amounts of insulin, which ultimately leads to an increase in blood sugar levels (Berbudi et al., 2020).

Chronic hyperglycemia is the defining feature of a heterogeneous illness that is referred to as diabetes type 2 Heterogeneity is evidence of etiology since it is caused by genetic inheritance and the interaction of this inheritance with environmental factors The primary pathophysiological mechanisms that induce reduced insulin secretion and decreased insulin sensitivity in type 2 diabetics, what lead to the development of hyperglycemia in this form of the disease Despite this, the hereditary origins of many ailments have only been shown for a relatively small percentage of the population Although it is generally accepted that decreased insulin secretion is a prerequisite for disease progression, it is not known whether impaired insulin secretion or its consequence is the primary abnormality in the majority of individuals This is although generally accepted that decreased insulin secretion is a prerequisite for disease progression (Östenson, 2001).

Many different things type 2 diabetes We are going to hold ourselves to the following standard Obesity causes metabolic syndrome, which can progress into type 2 diabetes In humans, Body mass index (BMI) measures obesity height that is greater than 30 kg/m2 Patients are considered to have progressed to Those with three of five disorders have metabolic syndrome hypertension (HTN), fasting hyperglycemia, elevated blood triglycerides, and low high-density lipoprotein The phrase "prediabetes" is frequently utilized when referring to metabolic disorders Patients with insulin resistance are initially diagnosed diabetic After a period of time in which the patient has coexisting

hyperinsulinemia, the pancreas may fail, which will result in the patient having hyperinsulinemia (Heydemann, 2016).

For more than 50 years, type 3 diabetes has been understood as hyperglycemia that appears during pregnancy and disappears after delivery, but there is now global agreement that hyperglycemic thresholds (GDM) are the most common pregnancy complication, and young women are more likely to develop diabetes and undetected hyperglycaemia, maternal obesity and overweight, advanced reproductive age, pre-diabetes, type 2 diabetes in the family, and ethnicity are risk factors for GDM You need a complete OGTT diet and exercise treatments are drug therapy treatments, usually insulin, used when blood glucose goals are not met The procedure reduces fetal overgrowth, obesity, and high blood pressure problems associated with pregnancy while improving immediate pregnancy outcomes Implementation of the strategy In the majority of the world, optimal management of mothers and newborns through long-term follow-up remains a challenge (McIntyre et al., 2019).

Women of childbearing age are suffering from an alarmingly high prevalence of obesity Diabetes mellitus during pregnancy, also known as gestational diabetes, affects around 2% to 18% of all pregnancies This condition is strongly associated with obesity (7-9) Regardless of the diagnostic criteria that are used, there has been an increase in the prevalence of GDM The illness known as diabetes mellitus type 2 (also known as GDM) is a complicated disease that is brought on by both genetic and environmental causes. Insulin resistance and a decline in the function of pancreatic cells are the defining characteristics of this condition, which occurs before diabetes Within a few years of delivering delivery, up to ten percent of women who have a previous history of GDM will develop T2D Afterward period of 10 years, there is a probability of 70% that there will be an injury (Koivusalo et al., 2016).

One of the worst health disasters the world has ever experienced is quickly turning into diabetes The prevalence of diabetes among adults worldwide is about 6% If no preventive measures are taken, the total number of diabetics is expected to reach 366 million In less than 30 years no country has ever needed to worry about diabetes It has significant global and societal ramifications, particularly in underdeveloped nations where young age diabetes can lead to human misery, disability, and unintended social and economic costs of curbing the disease epidemic Diabetes worldwide and the emergence of consequences such as retinopathy, nephropathy, neuropathy, CVD,PVD, and stroke, a concerted international effort to change human behavior and lifestyle is essential for this formula to be effective Nurses should take the lead in their policy positions to ensure that individuals with diabetes become aware of their disease and that by doing so the health care resources and processes can be used with reasonable confidence wiser to reduce the actual financial and human costs (Meetoo et al., 2007).

Insulin, an anabolic hormone, is produced by beta cells in pancreatic islets Beta cells make insulin The primary function of this hormone is to encourage glucose uptake by adipose tissue and skeletal muscle, which is another way of saying that it lowers the amount of glucose that is found in the blood This hormone accomplishes this by increasing the rate at which glycogenolysis glucose occurs in fat and muscle Insulin reduces a process known as lipolysis, which is the breakdown of lipids that takes place in adipose tissue This process takes place when fat cells break down Other hormones, such as glucagon and catecholamines, are able to partially counteract the effects that insulin has on the metabolic rate When a person develops type 1 diabetes, the beta cells in their pancreas are targeted by the immune system and destroyed as a result This particular form of diabetes affects only 5%–10% of diabetics (Adeyinka & Kondamudi, 2018).

2.2 A Causes of Diabetes Mellitus

Each form of diabetes has its own unique set of anomalies and root causes We recall the case in general and the many elements it generates based on existing studies Damage to autoimmune beta cells, along with environmental factors, genetic predisposition, inadequate neonatal feeding practices, and virus infection, are all potential causes of type 1 diabetes, However, elevated blood pressure, increased body mass index (BMI), lack of physical activity, unfavorable blood lipids, dietary choices, and genetics are all risk factors for type 2 diabetes In order to improve outcomes for diabetic patients, it is crucial to get an understanding of these factors for both kinds of disease Any person can use this knowledge to identify the type of diabetes they or someone else has, which could potentially save a life in a medical emergency (Maina, 2018).

2.2.1 Causes type 1 Diabetes Mellitus

Understanding the complicated origins, clinical care, prevention, and treatment of type 1 diabetes relies heavily on the findings of epidemiological studies of the disease Worldwide, the incidence of type 1 diabetes has increased by 2% to 5%, according to data from large epidemiological studies, and the prevalence of type 1 diabetes in the United States is roughly 1 in 300 by the age of 18 years old Factors such as population size, location, wildlife, and culture are all in play (Maahs et al., 2010).

Risk variables include but are to age, gender, race, genotype, and location The majority of diagnosed cases of diabetes occur in those younger than 20 The median age at diagnosis of type 1 diabetes has risen from 10 to 14 years Young persons under the age of 35 have the highest incidence rates of type 1 diabetes in Europe (0-4 years) Rates of occurrence fall following the onset of puberty and seem to level off between the ages of 15 and 29 Women are disproportionately affected by autoimmune diseases There is no gender difference in the prevalence of type 1 diabetes among adolescents (Shojaeian & Mehri-Ghahfarrokhi, 2018).

2.2.1.1 Destruction of the Beta Cells Caused by the Autoimmune System

Death of insulin-producing beta cells in the pancreas leads to type 1 diabetes, a potentially fatal autoimmune disorder Genes for disease susceptibility have been extensively studied during the past few decades, but our knowledge of environmental risk factors has lagged (Butalia et al., 2016).

Insulin shortage, the underlying condition that leads to diabetes, is typically brought on by the loss of the beta cells in the pancreas, which are responsible for manufacturing the hormone The immune system mounts an assault on healthy cells This is strange because the immune system is responsible for warding off disease by eliminating harmful bacteria, viruses, and other invaders In spite of the gradual nature of this cell death, illness manifestations tend to be quite abrupt. This type of diabetes is commonly seen in teenagers and young adults, hence the name "juvenile diabetes" (Maina, 2018).

The National Institute of Diabetes and Digestive and Kidney Diseases describes latent autoimmune diabetes in adults (LADA), another type 1 diabetes that also develops slowly In most cases, doctors don't suspect anything until the patient is older than 30 LADA beta cells are the primary target of the immune system's destruction People with LADA can still produce insulin at the time of diagnosis, but they will require insulin injections or an insulin pump to maintain normal blood sugar levels (Rivas et al., 2011).

In some theories, environmental variables play a crucial role in the demise of autoimmune beta cells While some may disagree, there is a consensus that this function persists long after a patient has been diagnosed (Almdal et al., 2008).

2.2.1.2 Environmental factors

Potential environmental risk factors include infection, dietary variables, air pollution, immunizations, site of residence, family environment, and stress Most of these factors, however, yielded contradictory findings, highlighting the need for additional investigation into the etiology of type 1 diabetes (Butalia et al., 2016).

Type 1 diabetes mellitus (T1DM) accounts for about 10% of all cases of diabetes worldwide, although it tends to affect young children and adolescents The pathophysiology of these conditions, and only a small percentage of sufferers (10%) classified as type 1B have immune, genetic, and environmental variants that lead to endocrine pancreatic cell death and inadequate insulin supply (Paschou et al., 2018).

2.2.1.3 Hereditary Predisposition

Type 1 diabetes is characterized by insulin deficiency caused by inflammation and selective autoimmune destruction of pancreatic beta cells Multiple loci have been identified during the past few decades, indicating a substantial genetic component to type 1 diabetes Human leukocyte antigen (HLA) class II molecules DQ and DR are suspected to be at least partially responsible for the development of type 1 diabetes in as high as 95% of all cases Some other genes, such as those that regulate T-cell activation and the insulin gene on chromosome 11, account for another 10 percent or more of the inherited susceptibility The fact that only 30%-40% of identical twins have the same disease suggests that other factors in the pathophysiology of type 1 diabetes may also play a role in its development (Butalia et al., 2016).

As of now, at least 20 different chromosomal areas have been related to type 1 diabetes (T1D) in humans through genetics using genomic screening, candidate gene testing, and examinations of human homologs in children with diabetes One combination of genes on chromosome 6p21 (IDDM1) is responsible for at least 40% of the cases in affected families Thirty percent of Type 1 diabetics have a heterozygous allele (formerly known

as HLA-DR3/4 and generally abbreviated to HLA-DQ2/DQ8), and there is a unique HLA-DQ6 molecule associated with dominant disease protection There is evidence that the form and function of the peptide binding pockets in HLA-DQ and DR molecules are responsible for a person's vulnerability or resistance to a particular disease Identification of the IDDM2 locus on chromosome 11p15.5 has been independently confirmed in both case and family studies, unlike associations with other putative IDDM loci The fact that the genetic basis of type 1 diabetes susceptibility may vary between ethnic groups is the most important factor influencing both association studies This discrepancy across research has been attributed to a number of factors Strategies for the future have been proposed to address these concerns Some of these strategies include increasing the sample size across similar ethnic groups, using high-throughput genotyping, and performing genome-wide linkage disequilibrium (LD) mapping to find ancestral haplotypes that are associated with disease Complex statistical methodologies and further investigation into the involvement of specific genes (functional genomics) in the development of type 1 diabetes will dominate future studies in this field (Pociot & Lernmark, 2016).

Even today, Eisenbarth's concept for the onset of type 1 diabetes is widely used Everyone is genetically susceptible to some degree to developing type 1 diabetes, while some people are more strongly predisposed than others For instance, about 5% of Caucasians have a genetic predisposition to develop type 1 diabetes The beta cells that produce insulin are destroyed after being exposed to certain environmental factors, the second stage that leads to a lack of insulin Diabetes has no known cure, although exogenous insulin can extend life expectancy and reduce complications like kidney failure, adult blindness, lower limb amputations, and cardiovascular disease Whereas other autoimmune diseases can lead to IBD, type 1 diabetes cannot cause it (Butalia et al., 2016).

Type 1 diabetes is caused by a complex interplay of genetic and environmental factors, which manifest in each individual in a slightly different way The hereditary risk is based on the presence of certain combinations of mechanisms that affect the key susceptibility site (HLA region) in cell recognition (Ilonen et al., 2019).

2.2.1.4 Viruses and infections

The disease is more likely to manifest at a young age among those who have autoantibodies against insulin or glutamic acid decarboxylase, or both After the initial generation of the autoantibody biomarker, a second, third, or even fourth antibody against the island-2 antigen or ZnT8 vector may arise As the variety of cell types containing autoantibodies grows, so does the risk of diabetes Rather than conclusively proving that a cell's autoantibodies are dangerous, this correlation represents reproducible biomarkers of pathogenicity HLA-DR3-DQ2, HLA-DR4-DQ8, or both haplotypes are substantial genetic risk factors for cellular autoimmunity; however, an environmental trigger is typically also necessary Beta-cell autoimmunity, normal blood glucose levels, and the absence of symptoms can be broken down into three stages of the disease's pathogenic mechanism There's the potential for a separate genetic connection between each of the three phases (Pociot & McDermott, 2002).

However, interaction with specific bacteria emerges as a substantial contributor to the development of type 1 diabetes, despite the fact that environmental factors affecting the onset of the disease are less well-defined than genetic ones While pathogenic microbes, such as those found in the gut microbiota, can affect immunological regulation, commensal bacteria play a critical role in shaping a developing immune system Certain nutritional characteristics have been shown to be important, according to the available evidence Several islet-specific autoantibodies can be discovered in the blood anywhere from a few weeks to 20 years before the onset of a clinical condition, and this pre-diabetes period presents a possible opportunity to manage the islet-specific immune response to prevent or delay beta-cell loss (Ilonen et al., 2019).

In type 1 diabetes, autoimmunity plays a role in the gradual loss of pancreatic cell mass through a process called apoptosis Causes of type 1 diabetes include genetic predisposition, exposure to certain environmental factors, and the body's own immune system attacking healthy cells Human epidemiological, clinical, and pathological investigations lend credence to the idea that infection with a virus, and specifically an enterovirus (like Coxsackievirus), may have a role in setting off the onset of type 1

diabetes. Several genes that are candidates for type 1 diabetes regulate immunological and cellular responses against viruses These include MDA5, PTPN2, and TYK2 Viruses can elicit a variety of innate immune responses from different tissues and cell types. regulate the level of viral tolerance in infected cells Some studies have found that infected pancreatic islet cells respond to prediabetes virus infection by eliminating the virus without undergoing apoptosis This difference may shed light on why alpha cells are not the target of the autoimmune response throughout the development of type 1 diabetes, but rather the continuously infected pancreatic cells This may also shed light on why certain subsets of islet cells have a harder time fighting off viral infection(Op de Beeck & Eizirik, 2016).

2.2.1.5 Infant feeding practices

Gestational diabetes mellitus (GDM) not only harms fetal development but also alters breast milk's composition, raising the infant's risk of developing type 1 diabetes later in life By acquiring sequencing windows for all possible fragment proteomics approaches, we compared the colostrum protein profiles of moms with GDM versus healthy mothers to see if there were any significant differences Altogether, 1295 proteins were identified, and comparisons between GDM and healthy moms revealed significant differences in 192 of those proteins Inflammation, lipid metabolism, and glucose regulation were all facilitated by a wide variety of pathways in these proteins like apolipoprotein E and lipoprotein lipase have an AOC of 1 GDM was also shown to cause an increase in the expression of 93 glycosylated peptides and a decrease in the expression of 42 glycosylated peptides in colostrum These findings improve our understanding of how gestational diabetes affects proteins, glycosylation levels, and milk regulation in newborns of moms with GDM (Zhang et al., 2021).

2.2.2 Causes type 2 Diabetes Mellitus

Type 2 diabetes's age and gender-specific causes were recently revealed by the Global Burden of Disease (GBD) branch statistics compiled by the Health Standards Institute in Seattle Trends in the prevalence of type 2 diabetes across the world and by region were analyzed for all age groups from 1990 to 2017 Prediction estimations were obtained with the help of the SPSS Time Series Modeler About 4.4% of those aged 15–49, 15% of those aged 50–69, and 22.0% of those aged 70+ had type 2 diabetes in 2017, making up 6.28 percent of the global population This equates to a prevalence of 6,059 cases per 100,000 people. Over a million people every year lose their lives to diabetes, making it the tenth greatest cause of mortality The incidence of diabetes is increasing over the world, but at an especially alarming rate in Western Europe and other economically advanced nations In terms of representation, both sexes are equally represented (Khan et al., 2020).

The development of type 2 diabetes is triggered by both hereditary and environmental factors Understanding the epidemic involves knowledge of environmental changes, as both genetics and the environment have a role in insulin resistance and beta-cell malfunction The scientific literature on potential non-genetic contributors to type 2 diabetes was thoroughly examined. The majority of cases of type 2 diabetes are brought on by environmental risk factors and biomarkers (Bellou et al., 2018).

The causes of type 2 diabetes are multifaceted, involving both genetic and racial predispositions and modifiable lifestyle choices like food, exercise, and smoking The rising prevalence of diabetes in emerging nations is mostly attributable to dietary and lifestyle factors (Sami et al., 2017).

Nutritional factors, including dietary patterns, food groupings, and nutrients, are associated with an increased risk of type 2 diabetes Unhealthy eating habits, such as diet and higher diets, are a leading cause of type 2 diabetes High-fat diets, including those that include red meat, artificially sweetened sugar, and sugary beverages, are strongly associated with an increased risk of type 2 diabetes (Toi et al., 2020).

One of the six major HCAIs (Cassini *et al.* 2016) and one of the most prevalent health concerns in patients referred to critical care units (Galiczewski and Shurpin 2017, Kumar *et al.* 2018) is healthcare-associated urinary tract infection (HCAUTI), this syndrome contributes for up to 40% of the 2 million HCAIs per year (Bizuayehu *et al.* 2022)

2.2.2.1 Hypertension

Previous research has shown that high blood pressure is a risk factor for developing type 2 diabetes Systolic blood pressure has been shown to be the most important risk factor for developing this condition patient at risk for low systolic blood pressure The findings indicated that hypertension was the primary risk factor for developing type 2 diabetes in individuals without a history of cardiovascular disease (Eryd et al., 2016).

Population studies demonstrate that those with hypertension are more likely to develop diabetes Insulin resistance, or a reduced biological response to a constant level of insulin, is a major contributor to the onset of diabetes, however, it has been obvious over the past few decades that insulin resistance is not just a metabolic problem, but rather a syndrome with multiple components, and that it can have a major effect on blood pressure homeostasis Disruption of the neuro-humoral and neuro-immune systems is a common mechanism in the development of both insulin resistance and hypertension These pathways aid in the upkeep of chronic low-grade inflammation, which interferes with insulin signal transduction Among the underlying molecular defects that contribute to insulin resistance include changes in insulin receptor shape, number, binding affinity, and/or signaling capacity One way that hyperglycemia interferes with insulin signaling is by causing the release of reactive oxygen species, which impede insulin-induced tyrosine autophosphorylation of the insulin receptor The degradation of insulin receptor substrate 1/2 by the proteasome, phosphatase-mediated dephosphorylation, and kinase-mediated serine/threonine phosphorylation are all additional mechanisms by which insulin signaling can be downregulated. Target organs for hypertension include left ventricular hypertrophy, atherosclerosis, and chronic kidney disease, with insulin resistance playing a crucial role in the onset and

progression of all three When taken together, these variations greatly increase one's risk of developing type 2 diabetes (Mancusi et al., 2020).

2.2.2.2 Obesity

The prevalence of type 2 diabetes in young men and women is said to be higher in cases of obesity in children and adolescents Due to its lack of symptoms, type 2 diabetes is often misdiagnosed In addition to research pointing to obesity as the root cause of type 2 diabetes, it has been found that elevated blood glucose levels in the obese are a more reliable indicator of the presence of the disease in the general population Muscle insulin resistance to type 2 diabetes will be shown to emerge in lean diabetics much before they gain weight The abnormal accumulation of fat that characterizes type 2 diabetes is mostly attributable to this insulin resistance Moreover, hyperlipidemia and excessive fat buildup are rooted in the development of insulin resistance in the muscles, which is the cause of type 2 diabetes (Malone & Hansen, 2019).

Diabetes's prevalence has quadrupled over the previous three decades, making it the ninth greatest cause of death worldwide Type 2 diabetes accounts for 90% of all cases of diabetes in adults worldwide (T2DM) Asia is a crucial region in the propagation of the rapidly expanding global T2DM pandemic, with China and India serving as the primary epicenters Genetic predisposition, bad eating habits, and a sedentary lifestyle all contribute to an increased risk of type 2 diabetes later in life, but obesity and increasing body mass are the most important risk factors. Avoiding many diseases and health problems is possible by making some changes to one's lifestyle, including maintaining a healthy weight, eating well, exercising regularly, giving up smoking, and drinking moderately (Zhang et al., 2021).

2.2.2.3 Smoking

Smoking is not routinely recognized as a controllable risk factor in these programs, despite growing evidence connecting it to hyperglycemia and type 2 diabetes We summed up the evidence linking smoking to an increased risk of developing type 2 diabetes by looking at how it affects insulin sensitivity and the function of pancreatic - cells Aiding smokers in giving up the habit can reduce their risk of acquiring diabetes (Maddatu et al., 2017).

Epidemiological and genetic research have found that quitting smoking can lower the risk of developing type 2 diabetes Smoking cessation is the current gold standard for lowering the risk of getting type 2 diabetes risk is increased by 1% in smokers compared to nonsmokers Researchers found a dose-response relationship between how often, how much, and how long people smoked, However, due to room for error and potential reversal of causality, the association between smoking and type 2 diabetes remains controversial (Yuan & Larsson, 2019).

2.2.2.4 Body Mass Index (BMI)

The prevalence of diabetes mellitus and of overweight people, with a high body mass index (BMI) being defined as a BMI more than or equal to 25 kg/m2, has skyrocketed during the past four decades in most countries In 2014, a total of 422 million persons were estimated to have diabetes, with a global incidence of 9% among men and 7% to 9% among women About 2.01 billion adults around the world are affected by (those with a BMI greater than 25 kg/m2), with the prevalence estimated to be 38.5% in men and 39.2% in women (Pearson-Stuttard et al., 2018).

Pancreatitis brought on by diabetes has been linked to obesity, according to a study funded by the World Cancer Research Fund and the International Agency for Research on Cancer (IARC) Furthermore, studies have shown that a high body mass index can

increase a person's chance of developing diabetes and cancer (Pearson-Stuttard et al., 2018).

2.2.2.5 Lipids

Receptors for fatty acids that are activated by G proteins are a promising new therapeutic target for controlling glucose homeostasis through modulating insulin and incretin secretion G protein-coupled receptors (GPCRs) are widely studied as prospective therapeutic targets due to their diversity, cell-specific expression, and easily accessible drug sites on the cell surface Clinical research suggests that targeting a GPCR triggered by fatty acid-derived lipids will improve glucose homeostasis and reduce complications in people with type 2 diabetes Lipidomic receptors are still interesting targets, even if more research is needed to describe their intracellular binding and signaling mechanism and toxicity examine the role of clinically verified GPCRs in glucose homeostasis in the context of larger discovery trends, alternate signaling pathways, and potential challenges (Gendaszewska-Darmach et al., 2019).

Having unhealthy blood lipid levels increases the likelihood of developing type 2 diabetes An inverse association between HDL cholesterol and illness risk has been demonstrated Studies have shown that low cholesterol levels are a major risk factor for this disease in females Insulin resistance syndrome, characterized by low HDL cholesterol and high triglyceride levels, has also been associated to low plasma cholesterol and high triglyceride levels This indicates that non-fasting levels of cholesterol and triglycerides are useful predictors of insulin resistance Multiple studies have shown that an increased BMI is linked to an increase in cholesterol and an unfavorable lipid pattern Additionally, increased triglyceride and decreased HDL cholesterol levels were linked to a greater body mass index It is also believed that shifts in LDP (low-density lipoprotein), cholesterol, and triglycerides are related to shifts in BMI (Wanjiru, 2018).

2.2.2.6 Genetics

Additional studies are being conducted to determine the role of common single nucleotide polymorphisms (SNPs) in the development of cardiovascular disease and type 2 diabetes Recently, epigenetic research has uncovered previously unknown links between these diseases Further, to better comprehend the underlying molecular pathways connecting type 2 diabetes and CVD cardiovascular disease, we intend to present an overview of these epigenetic connections The number of commonalities between type 2 diabetes and CVD and epigenetic regulation is growing quickly However, these pathways are usually discussed in the context of a single pathology, while a more holistic approach would be preferable in order to fully account for the many possible connections that exist between type 2 DM and CVD (De Rosa et al., 2018).

2.2.2.7 Physical Inactivity

Prediabetes, or mild hyperglycemia, is associated with an increased risk of acquiring type 2 diabetes To reduce their chances of acquiring type 2 diabetes, all high-risk individuals are encouraged to adopt healthier eating and exercise routines People who are genetically susceptible to developing type 2 diabetes may be able to avoid or delay the disease if they make dietary and/or physical activity changes (Hemmingsen et al., 2017).

Managing type 2 diabetes requires making some lifestyle changes, particularly in regard to nutrition and exercise The effects of food and exercise therapies on HbA1c and body weight in patients with type 2 diabetes are prognostic of the disease's development and severity (Cradock et al., 2017).

2.2.2.8 Low Education

Disease control requires patients to make difficult self-management decisions on a regular basis Although there have been advancements in treatment and clinical practice standards have been made available, only 30% of patients achieved their glycemic, blood pressure, and cholesterol goals In actuality, around 95% of diabetes care is delivered by people with type 2 In order to effectively manage one's health and make educated decisions about one's medical care, health literacy is essential to Maintain or enhance the quality of life by choosing actions that promote health and prevent illness In addition to a lack of health information, those with low HL also report feeling unwell (Abdullah et al., 2019).

Adults with type 2 diabetes who knew less about the disease were more likely to have problems There is little chance that people will alter their behavior based on the belief that self-management of diabetes and thorough familiarity with the disease are the solutions to the problem Glycemic regulation may be affected by a wide variety of variables, such as educational attainment, employment, family health, and social literacy (D'Souza et al., 2017).

2.2.2.9 Dietary pattern

Clinical trials and observational research demonstrate that consuming whole grains, almonds, coffee, moderate amounts of alcohol, and less red meat reduces the risk of diabetes Manufactured and homemade sugary drinks are popular. Most people eat a variety of foods, which increases diabetes risk Examining dietary habits is an approach to fixing this issue Observational studies can extract growth information from dietary records Advanced approaches require information on the dangers and benefits of specific foods to predict dietary adherence The Mediterranean Diet, based on the USDA Dietary Guidelines, includes several nutrients and foods that minimize diabetes risk (Jannasch et al., 2017).

2.2.2.10 Different eating practices, patterns and habits

Consequences of the many types of bad eating habits that lead to Type 2 Diabetes The rising prevalence of diabetes in low-income countries is mostly attributable to changes in eating habits and in levels of physical activity Patients with type 2 diabetes who have an HbA1c level that is too high are at increased risk for developing both microvascular and macrovascular complications Patients can avoid diabetic problems by bringing their HbA1c levels down with careful dietary management Educating the public about the dangers of diabetes and encouraging healthier eating habits can help reduce the prevalence of the disease Stakeholders (healthcare providers, health facilities, agencies involved in diabetes care, etc.) should work to raise patients' awareness of the importance of a diet that may aid in disease management, proper self-care, and improved quality of life(Sami et al., 2017).

Weight gain, obesity, leading a sedentary lifestyle, and increasing consumption of unhealthily high-red meat, processed meat, refined carbohydrates, and sugar-sweetened beverages are the main causes of the global T2DM epidemic Large-scale clinical studies have demonstrated that dietary and lifestyle changes can successfully prevent T2DM in high-risk patients Given its widespread effects, it is imperative to put in place efficient type 2 diabetes prevention programs in order to stop the spiral of diabetes that results in transgenerational diabetes mellitus (Costanzo et al., 2015).

2.2.2.11 Alcohol

Men who drink have a higher risk of developing type 2 diabetes Studies of populations with the hope of gaining insight into the future Greater alcohol consumers had a higher chance of developing type 2 diabetes than those in the lowest consumption group There was a nonlinear correlation between alcohol use and the likelihood of males becoming hurt. Drinking up to 57 grams of alcohol daily did not raise the chance of developing type 2 diabetes. Reducing alcohol consumption is one recommendation for a healthy lifestyle that has been shown to lower the risk of getting type 2 diabetes (Han, 2020).

Insulin resistance at the periphery and mild systemic inflammation are hallmarks of type 2 diabetes. Specialized inflammation-resolving mediators' plasma (SPMs) are thought to be responsible for the process of inflammation resolution, which could ultimately alleviate chronic inflammation. The continuous inflammation associated with type 2 diabetes may be influenced by alcohol's capacity to disrupt the creation of SPMs by affecting key enzymes involved in SPM formation (Barden et al., 2018).

2.2.2.12 Acute Pancreatitis

One of the most frequent and serious forms of gastrointestinal illness requiring hospitalization is acute pancreatitis (AP), an inflammatory disease of the pancreas More than 60% of AP cases are seen in adults, and the prevalence rises with age in both sexes Numerous factors contribute to this condition, but two of the most frequent are alcoholism and gallstone migration in the common bile duct A accumulation of pancreatic fluid, or pancreatitis, is triggered when gallstones (which can be composed of cholesterol or bile) obstruct the pancreatic ducts The second leading cause of AP, alcoholism, is also more common in middle-aged people, with the highest prevalence seen between 45 and 55 The acini of the pancreas are metabolically damaged by alcohol consumption Stimulation of cholecystokinin secretion, obstruction of tiny channels, early enzymatic activation, changes to blood flow and the sphincter, and various other changes all play a role in producing these effects Changes in glucose metabolism result from disruptions in the endocrine function of the pancreas For this reason, a score for the severity and mortality of AP includes high glucose levels as a risk factor for diabetes (Albai et al., 2017).

2.2.2.13 Liver

Diabetes is managed and controlled in part by the liver, which stores glucose and generates endogenous glucose from glycogen. The liver also plays a role in lipid metabolism and other metabolic pathways. It's no secret that cirrhosis, a frequent form of chronic liver disease, can drastically lower quality of life and shorten one's lifespan. There is increasing evidence linking diabetes to liver diseases such hepatitis, cirrhosis,

and cancer. Having diabetes and liver problems at the same time is a recipe for rapid decline. Diabetes and cirrhosis are related conditions. Therefore, reducing cirrhosis symptoms may help with diabetes control (Y. Zhao et al., 2019).

Due to the high incidence of obesity and insulin resistance in type 2 diabetes mellitus, this condition is linked to an increased risk of developing Non-Alcoholic Fatty Liver Disease NAFLD. Though NAFLD is a potential cause of hepatomegaly and liver dysfunction in T1DM, it must be distinguished from the more common glycogen hepatopathy Obese people with diabetes can reduce their risk of developing the nonalcoholic fatty liver disease by adopting a healthier lifestyle that emphasizes eating better and doing more exercise In light of the fact that bariatric surgery can correct NAFLD in T2DM, newly licensed weight-loss drugs should be studied for their effect on the onset and progression of NAFLD Blood glucose is controlled by medications like thiazolidinediones (TZDs), glucagon-like peptide-1 (GLP-1) antagonists, dipeptidyl peptidase inhibitors, and statins in people with type 2 diabetes; there is some evidence that these medications may also play a role in preventing the development of the disease (Bhatt & Smith, 2015).

2.3 Complications of Diabetes Mellitus

Half of all patients with diabetes do not know they have the disease and, as a result, are at increased risk for complications Whether a person has type 1 or type 2 diabetes, complications are a common source of severe morbidity and mortality There are two main categories of chronic complications caused by diabetes microvascular and macrovascular The prevalence of microvascular disease is much higher than that of macrovascular illness. Microvascular complications include neuropathy, nephropathy, and retinopathy; macrovascular issues include cardiovascular disease, stroke, and peripheral artery disease Diabetic foot syndrome describes the presence of a foot ulcer together with neuropathy, peripheral arteriopathy, and infection This medical problem is a major cause of lower-body amputations Because of their distinct natures, other diabetes-related disorders such as dental disease, decreased infection resistance, and

obstetric complications in pregnant women with gestational diabetes cannot be included into the two groups outlined above (Papatheodorou et al., 2018).

Many issues arise from diabetes because of the disease's link to poor lipid, protein, and glucose metabolism. When thinking about diabetes mellitus, it is important to examine the role that inflammatory aging and oxidative stress play in the loss of insulin function and the subsequent disruption of metabolism. Aging-related inflammation and oxidative stress are connected to diabetic complications (Halim & Halim, 2019).

Complications typically manifest in the kidneys, eyes, and nervous system; diabetic nephropathy is the leading cause of end-stage and incapacitating kidney disease Diabetic neuropathy is the leading cause of limb loss, foot ulcers, and impotence, and it disproportionately affects those with diabetes Since up to 25% of people with T2DM who received a new diagnosis may already be experiencing microvascular problems, it is imperative that we address these issues (Faselis et al., 2020).

Long-term microvascular issues in diabetes can cause major complications or even death Small and large blood vessel issues are caused by both excessive blood sugar and atherosclerosis High blood pressure is a common complication for those who have diabetes Diabetic nephropathy is a microvascular complication that develops when high blood pressure causes glomerular hyperfiltration Hypertension and diabetes both contribute to atherosclerosis' progression, Therefore, hypertension plays a pivotal role in the progression of both microvascular and macrovascular complications in persons with type 2 diabetes (Yamazaki et al., 2018).

Many young people in low and middle-income countries are expected to be among the at least 400 million people globally who will have type 2 diabetes by 2030. Myocardial infarction (MI) and stroke are two examples of major vascular events that could occur. The disease's effect on the microvasculature makes it a prominent cause of both blindness and kidney failure in affluent nations People with diabetes tend to have higher blood pressure than the general population, and hypertension (high BP) is a known risk factor for developing diabetes (Emdin et al., 2015).

Maintaining the association between BP and illness outcome, systolic BP levels of 115 mm Hg and diastolic BP levels of 75 mm Hg are associated with an increased risk of events in the overall adult population Recent studies have shown an increased risk of hypertension, cardiovascular disease, and vascular sickness in patients with type 2 diabetes Data are not yet available for every demographic subgroup and every outcome, but the nature of the BP connection appears to be consistent across vast and diverse groups, including men and women of all ethnicities, persons of all ages, and those with and without documented vascular disease (Emdin et al., 2015).

The World Health Organization (WHO) reported on March 19, 2020, that the novel coronavirus disease (2019-nCoV) is linked to significantly increased blood glucose levels and significantly increased insulin resistance, suggesting pancreatic cell dysfunction or programmed cell death and the inability of insulin to eliminate glucose in cellular tissues. Along with hypertension, cardiovascular illness, advanced age, male gender, and, more recently, obesity, diabetes is recognized as one of the most significant pre-existing comorbidities substantially related to COVID-19 Metabolic syndrome; systemic and tissue renin-angiotensin-aldosterone system activation; oxidative stress; inflammation; islet fibrosis; amyloid deposition; beta-cell failure; and apoptosis are all contributors to lymphocytosis Understanding how COVID-19 promotes cell and islet damage and remodeling that leads to long-term problems of diabetes may be aided by light and electron microscopy in preclinical rodent and human islet models (Hayden, 2020).

Researchers have found that the disease gets worse and kills more people when people are older and have other health problems, like diabetes Studies from the most affected countries, such as China, the US, and Italy, seem to show that the number of COVID-19 Diabetic people do not have a greater mortality rate than the general population. As a result, having diabetes is not a precursor to contracting SARS-CoV-2 However, there is substantial proof that diabetes is a contributor to getting sicker, getting Acute Respiratory Distress Syndrome, needing mechanical ventilation, or going to the intensive care unit, and then dying The ways in which COVID-19 and diabetes are connected still need to be figured out, In particular, it's still not clear if COVID-19

patients have a worse outlook because of diabetes itself, especially if it's not well controlled, or because of the complications and other diseases that come along with it In fact, conditions that tend to go together with diabetes, like obesity and high blood pressure, or with the complexity of chronic hyperglycemia, like heart disease and chronic kidney disease, have also been linked to a poor prognosis in these people, and studies haven't shown consistently that diabetes predicts disease severity on its own (Pugliese et al., 2020).

2.3.1 Acute complications of Diabetes Mellitus

Acute and life-threatening diabetes complications such as hypoglycemia, diabetic ketoacidosis (DKA), and hyperglycemic state (HHS) necessitate rapid recognition, diagnosis, and treatment. Anti-diabetic medications frequently cause hypoglycemia as a side effect. Adverse clinical outcomes, including as cardiovascular morbidity and death, have been linked to the occurrence of hypoglycemia episodes in diabetes patients. Depending on how severe it is, hypoglycemia needs to be treated right away. Hyperglycemic crises, such as those seen in DKA and HHS, occur when insulin levels are too low or too high, respectively, and are followed by an excess of anti-regulatory hormones. Extreme hyperglycemia, metabolic acidosis, and dehydration are distinguishing features between the two states. In comparison to individuals with DKA, those with HHS have a mortality risk that is almost 10 times higher. Age, degree of volume depletion, and the existence of comorbidities all play a role in the prognosis of DKA and HHS. Volume replacement, insulin therapy, resolving fluid and electrolyte imbalances, and addressing sedimentation causes are the cornerstones of treatment for both DKA and HHS. Patients can benefit greatly from education and intensive clinical monitoring in order to avoid or lessen the severity of all three diabetic emergencies (Bae & Kim, 2021).

The seven subcategories of complications that make up the Diabetes Complication Severity Index are a worldwide health problem because of the link between diabetes and cardiovascular and cerebrovascular disease. Reducing the likelihood of adverse cardiovascular events and their associated effects, even in pre-diabetes, requires early

identification of patients with diabetes at risk of acute cardiovascular disorders, such as acute coronary syndrome and stroke, based on symptoms and the patient's history (Hu & Lin, 2018).

Serious hypoglycemia episodes in insulin-treated patients can cause unconsciousness, bone fractures, brain trauma, coma, myocardial ischemia, hemiplegia, arrhythmias, myocardial infarction, heart failure, or even death The consequences of these problems are seen in form of elevated medical costs and lost productivity Diabetics on insulin have a number of challenges, the most pressing being the prevalence of severe hypoglycemia and its correlation to higher healthcare utilization and costs (Yue et al., 2020).

Patients with diabetes have a lot of additional problems, to Hyperglycemia, insulin resistance, dyslipidemia, hypertension, and immune dysfunction are all linked to the complex pathophysiology of this condition As the oral cavity is so densely packed with blood vessels and nerves, complications from these disorders are to be expected there The connection between diabetes and gum disease has been studied extensively over the past few decades. Neglecting oral hygiene can lead to dental caries, dry mouth, oral mucosal lesions, oral cancer, taste anomalies, temporomandibular joint (TMJ) issues, burning mouth syndrome, apical gingivitis, and peri-implantitis (Verhulst et al., 2019).

One of the most serious consequences that can arise after coronary artery bypass grafting is acute kidney damage, abbreviated as AKI. It has been hypothesized that an acute phase reactant known as serum albumin may be connected to the onset of acute renal insufficiency that follows a variety of surgical operations. In diabetic individuals who had post-isolated coronary artery bypass grafting done, a low preoperative blood albumin level was related with the development of postoperative acute renal failure. It is emphasized that an adjustable albumin level should be considered prior to operation since it is simple to regulate and it is practically viable to prevent diabetic patients from developing acute renal failure (Aksoy et al., 2019).

Stupor, coma, and death can result from ketoacidosis if not treated, as can a less common non-ketogenic hyperosmolar syndrome related to uncontrolled diabetes The anomalies in glucose, lipid, and protein metabolism that characterize diabetes are due, in large part, to the failure of insulin to act on its target tissues Impaired insulin action results from inadequate insulin secretion and decreased tissue responses to insulin at one or more locations along the complex hormone action pathways (Balaji et al., 2019).

Infectious illnesses, particularly pneumonia, are seen in persons over the age of 70 and are a consequence of diabetes. Patients with diabetes, especially those with nephropathy, have a shorter lifespan if their blood sugar levels are not kept under control. Diabetes patients whose blood sugar levels were poorly managed lived shorter lives than those whose blood sugar levels were well managed (Nakamura et al., 2017).

New research reveals that HbA1c variability, in addition to HbA1c itself, can be used as an indicator of mortality as a complication of diabetes as well as mortality. This is in addition to the fact that HbA1c itself can be used as an indicator of mortality (Lee et al., 2021).

Ketoacidosis is the diabetic complication of type 1 diabetes that occurs the most frequently (DKA) (Adeyinka & Kondamudi, 2018).

Hyperglycemic syndrome, often known as HHS, is a clinical disease that can develop as a consequence of diabetes mellitus. Diabetes type 2 patients are most likely to experience this complication. Won Freirich and Drichfield were the ones who first described the disorder and documented diabetic patients who had hyperglycemia and glycosuria but did not have the hallmark Cossmaul respiration or acetone in the urine that is seen in diabetic ketoacidosis. This clinical disease was once known as non-ketogenic hyperglycemic coma, non-ketogenic hyperosmolar syndrome, and non-ketogenic hyperosmolar coma. All of these names refer to the same thing (Adeyinka & Kondamudi, 2018).

Complications of type 2 diabetes can be life-threatening and even fatal, including HHS. It is possible for HHS to have a mortality rate as high as 20%, which is approximately ten times higher than the mortality rate associated with diabetic ketoacidosis. The clinical symptoms and prognosis of HHS are dependent on a number of criteria, including age, the degree of dehydration present, and the presence or absence of underlying comorbidities (Adeyinka & Kondamudi, 2018).

Diabetes' chronic problems stem mostly from cellular and molecular impairments in neurovascular structure and function brought on by growth hormones. Long-term diabetic problems are significantly influenced by oxidative damage brought on by growth hormones. Impairment of cell, tissue, and organ function may result from neuropathy and angiopathy brought on by DM (Lotfy et al., 2017).

One potential risk factor for diabetic complications is fluctuating glucose levels. Diabetes problems are thought to result from fluctuations in blood sugar due to oxidative damage. However, there is currently no agreed-upon method for evaluating glucose fluctuations. Standard deviation calculation and mean amplitude of hyperglycemia excursions are two representative indices for measuring intraday variation (MAGE). MAGE is used to track important movements during the day and can be easily quantified with CGMs. Recent clinical data imply that long-term glycemic fluctuation, as measured by variability in hemoglobin A1c, may contribute to the development of microvascular problems, however there are no randomized controlled trials to support this. An increase in the rate of progression of Changes in blood sugar levels throughout the day have also been linked to the development of coronary artery disease in high-risk patients (H. S. Jung, 2015).

Diabetes-related eye issues are on the rise and are expected to overtake all others as the leading global health problem within the next several decades. Diabetic retinopathy, papillomatosis, cataracts, glaucoma, and ocular surface disorders are the five major eye issues linked with diabetes that can be avoided with timely diagnosis and treatment (Sayin et al., 2015).

It seems that macrovascular complications of diabetes have more of an impact on women, while microvascular issues are more common in men. Without diabetes, women actually have a lower lifetime risk of having micro or total vascular disease than men do. The role of sex hormones and sex-based risk factors is central to this. Evidence suggests sex hormones are involved in controlling heart rate and blood pressure. Even though androgens are damaging to cardiovascular health, estrogen is widely regarded as a preventive factor (Maric-Bilkan, 2017).

2.4 Prevention of Diabetes Mellitus

Among patients with diabetes, cardiovascular disease is a leading killer In light of the positive effects that antidiabetic medications have on cardiovascular health, cardiologists have been encouraged to investigate this treatment option The value of cardiologists is expected to rise as the clinical landscape changes to incorporate more investigation into antidiabetic medications with cardiovascular benefits in prediabetes Current guidelines propose high-intensity lifestyle intervention or metformin as the primary means of preventing diabetes Here, argue that cardiologists can also help prevent diabetes by intervening directly, referring patients to community-based high-intensity lifestyle treatments, and participating in advocacy, policy, and development. Particularly since many of their patients would be prediabetic, they need special guidelines. The patient's message should be that avoiding type 2 diabetes is the best strategy to decrease their chance of developing a microvascular illness, reduce their overall healthcare costs, and improve their health-related quality of life (Carris et al., 2019).

They're common in people with microvascular disorders People with diabetes have a greater mortality rate due to catastrophic complications, and they frequently undergo great mental and physical anguish as a result of their disease There is growing evidence from both observational studies and clinical trials that vitamin K2 decreases the risk of diabetes through increasing insulin sensitivity and glycemic control Vitamin K2 has anti-inflammatory and lipid-lowering properties and is necessary for the creation of the vitamin K2-dependent protein osteocalcin, which increases insulin sensitivity There was

a clear superiority of vitamin K2 over vitamin K1 in the fight against diabetes (Li et al., 2018).

The production of taurine, an essential amino acid, takes place via a conditionally necessary process in the mammalian pancreas and results in the free form of taurine known as cysteine sulfuric acid, which is found all over the body Due to antioxidant and anti-inflammatory properties, they have therapeutic use Multiple studies have shown the great therapeutic potential of treating diabetes and its many consequences, such as neuropathy, retinopathy, nephropathy, hematological imbalances, reproductive dysfunctions, liver and pancreas disease, etc. Especially helpful in preventing diabetes-related problems (Sarkar et al., 2017).

Reducing excess body weight by 5-10% and consistently increasing moderate physical exercise by 150 minutes per week has been demonstrated to delay the onset of diabetes in high-risk populations Furthermore, drug interventions have been shown to prevent diabetes in high-risk populations After having bariatric surgery, one is much less likely to develop type 2 diabetes Current recommendations for lowering diabetes risk emphasize a lifestyle modification intervention that emphasizes losing weight and increasing physical exercise (Allende-Vigo, 2015).

Recurrent cardiovascular incidents can be avoided by using low-dose aspirin daily to be sure, aspirin has a place in primary prevention in people who don't already have cardiovascular disease. Even in lower-risk patients, the increased risk of bleeding, especially cerebral and gastrointestinal bleeding, may outweigh the minor benefit of avoiding major vascular events Aspirin therapy may be useful in people with diabetes mellitus because the disease is linked to an elevated risk of both primary and recurrent atherosclerotic thromboembolisms After discussing the broad strokes of aspirin pharmacology and some of the more narrowly focused concerns in diabetes (Capodanno & Angiolillo, 2016).

Complementary and alternative medicine (CAM) was used by patients with diabetes at a rate of 1.6% higher than the total population. 57% of patients with diabetes in a nationally representative telephone survey said they had used CAM within the previous year. Massage, acupuncture, spiritual healing, etc. are also examples of CAM that are not limited to nutritional supplements, even if they play an important role. It is important to consider nutritional supplements, which may play a role in prevention because patients are willing to try CAM (Candidate et al., 2018).

2.4.1 Prevention of T1DM

2.4.1.1 Nicotinamide (B3):

Diabetes kills retinal ganglion cells Diabetic retinas may have more oxidative DNA damage from oxidative stress Nicotinamide produces nicotinamide adenine dinucleotide, which helps repair DNA nicotinamide protects diabetic retinal neurodegeneration by repairing DNA Sprague-Dawley rats with streptozotocin-induced diabetes were given oral nicotinamide for 4 or 12 weeks Nicotinamide therapy reduced oxidative stress 4 weeks after diabetes induction but increased it 12 weeks after diabetes onset 8-OHdG, a DNA damage marker, increased 4 and 12 weeks after diabetes development but decreased with nicotinamide. Nicotinamide reduces diabetes-induced GFAP production. Western blots showed that nicotinamide decreased cleaved Diabetic patients had increased apoptosis of inner retinal cells, whereas nicotinamide therapy helped Lastly, nicotinamide may prevent oxidative DNA damage and promote DNA repair to reduce diabetic retinal neurodegeneration (K. I. Jung et al., 2022).

2.4.1.2 Polyunsaturated Fatty Acid Omega-3

While there is some indication that taking n-3 PUFA supplements can help prevent type 1 diabetes in humans, that study is still in its infancy and is primarily limited to animal studies at this time Research shows that n-3 PUFA supplementation improves vascular health and metabolic parameters in T2D patients and that it reduces the risk of

microvascular complications in animals, However, in randomized controlled studies of n-3PUFA supplementation in T2D, no significant improvements in vascular events were seen. Adults with and without diabetes are encouraged by current dietary guidelines to eat more n-3PUFA-rich foods, but n-3PUFA supplementation is not recommended. These recommendations for people with diabetes are based on information from studies conducted on people with T2D only, as there have been relatively few randomized controlled trials examining the effect of n-3PUFA supplementation on vascular or metabolic outcomes in T1D Problems with most randomized controlled studies of type 1 diabetes include short-term supplementation, low dosages of n-3PUFA, and a failure to pay attention to baseline fatty acid profiles (O'Mahoney et al., 2020).

2.4.2 Prevention of T2DM

2.4.2.1 Chromium

The effect of chromium on glucose metabolism and lipid profile in type 2 diabetics has been demonstrated across multiple data sets Extraction of data, quality assessments, and reviews of related literature were all performed Hemoglobin A1c, fasting plasma glucose, triglycerides, total cholesterol (TC), low-density lipoprotein, and high-density lipoprotein were all examined statistically sugar levels, and fat levels When comparing the experimental and control groups, only one HbA1c indicator showed a meaningful difference Glycated hemoglobin is reduced by chromium supplementation in type 2 diabetics, but neither blood glucose nor lipids (F. Zhao et al., 2021).

2.4.2.2 Magnesium

In terms of body content, magnesium is the fourth most abundant mineral More than 300 enzyme reactions require it as a cofactor due to its essential involvement in ATP catabolism Protein synthesis, DNA and RNA synthesis, and reproduction all require magnesium is essential for a wide variety of cellular processes, including muscle contraction, blood pressure regulation, insulin metabolism, cardiac excitability, vascular

motor tone, nerve transmission, and neuromuscular conduction Hypomagnesemia is more common than hypermagnesaemia, but both can lead to cardiovascular, muscular, and nervous system diseases Due to its importance in so many different bodily processes, it should come as no surprise that magnesium has a role in both the treatment and prevention of a wide range of diseases Magnesium deficiency has been linked to increased risk of developing several chronic diseases and disorders (Gröber et al., 2015).

2.4.2.3 Vitamin D

Getting adequate vitamin D may help prevent type 2 diabetes Because serum concentration of 25-hydroxyvitamin D is an excellent biomarker of vitamin D status and an excellent marker of good general health, there is significant room for misunderstanding in investigations of vitamin D supplementation Normal glucose-tolerant individuals with type 2 diabetes unsupported by poorly-powered trial results and post-trial analyzes targeting outcomes for non-diabetics Vitamin D supplementation can help reduce diabetes risk in high-risk groups (Angellotti & Pittas, 2017).

2.4.2.4 Fenugreek

Some of the most effective medicines on the market today have their origins in plants or are made using plant ingredients It has been generally noticed that medicinal plants are used as a primary foundation for health maintenance in the majority of developing countries The use of herbs and other types of alternative medicine is becoming increasingly popular all around the world Reducing the prevalence of prediabetes an important step in mitigating the worldwide impact of To have a food supplement that can affect glucose homeostasis and improve lipid markers would be ideal Despite claims that other herbs have antidiabetic activity, fenugreek seeds (Trigonella foenumgraecum) have been shown to be among the most effective and safe in this regard through extensive research and widespread historical use Fenugreek seeds are beneficial for diabetics in several ways, including their high fiber content For the past two decades, studies have demonstrated that fenugreek seeds can assist diabetics to

control their blood sugar levels Researchers have found that it can help people with diabetes by lowering their fasting blood sugar levels and increasing their tolerance to glucose Fenugreek is a dietary supplement that reduces blood sugar (Gaddam et al., 2015).

2.4.2.5 Curcumin Extract

The scientific community is starting to pay more attention to curcumin. The rhizome of the plant Curcuma longa, widely known as turmeric, contains the bioactive chemical curcumin. Antioxidant, cardioprotective, anti-inflammatory, antibacterial, kidney-preventing, anticancer, hepatoprotective, immunomodulatory, hypoglycemic, and antirheumatic are only a few of the pharmacological and biological properties of curcumin that have been identified in both in vitro and in vivo research. Curcumin extract slows diabetes progression, enhances beta cell activity, protects against beta cell death, and lowers insulin resistance in animal models (Pivari et al., 2019).

2.5 Management of Hyperglycemic

A high blood sugar level is associated with large expenses, both in terms of morbidity and medical care. Fluid replenishment, insulin medication, and electrolyte correction are the components of management for this condition. However, there are still some aspects of patient management that are up for discussion. It is possible to compare measures of arterial pH, venous pH, and bicarbonate pH in individuals who are suffering from respiratory failure or hemodynamic instability. The stage of regeneration, as well as the condition of the patient both, play a role in determining which fluids are used. When a patient has severe hypovolemia, the primary choice in fluid replacement should be normal saline. However, the patient's sodium concentration should be taken into consideration while choosing a fluid to drink if they are only mildly or moderately dehydrated. Instead of focusing on blood glucose levels, insulin therapy should be directed by the normalization of beta-hydroxybutyrate levels. Recent years have seen the development of new iterations of the tried-and-true insulin infusion techniques. It is possible that an initial dose of insulin is not necessary, and an infusion of insulin at a

constant rate offers the greatest option for suppressing the generation of glucose by the liver as well as ketogenesis and lipolysis. Treatment with bicarbonate, phosphate, and low molecular weight glucose has been shown to be safe and effective for treating diabetic ketoacidosis that is mild to moderate. Simplified protocols that use subcutaneous rapid-acting insulin analogs for this purpose have been shown to be safe and effective. The use of heparin is still debatable, and there is an immediate need for randomized controlled trials in order to better patient treatment and lower fatality rates linked with emergencies brought on by hyperglycemia (Cardoso et al., 2017).

Managing one's glucose levels can be a powerful preventative tool in the fight against diabetes. Chronic complication risk and progression Combinations of pharmaceutical and nonpharmaceutical therapies, as well as behavioral modifications, including increased physical activity and dietary restriction, are typically incorporated into treatment plans (Salci et al., 2017).

Administering Medicines Check-ins and diagnostic procedures at regular intervals Controlling blood pressure after quitting smoking Immunizations, mental health care, and the management of long-term consequences Complexity theory helps us make sense of this multifaceted and contradictory setting by including ideas like system and network security. Based on the scientific multidimensional premise that reality should be thought and appreciated on the basis of its fundamental, historical, social, and ethical features together with its complexity, this theory makes it possible to identify a wide variety of facets of reality. Specifically, the DM of Health Directive care protocols. Primary care providers should be reminded that preventing, identifying, and treating these problems in patients with DM should be part of their follow-up care. The primary care network within the healthcare system should coordinate the arrangement of treatment plans and cross-references. Those working in the field of family health strategy might use these procedures as a standard (Salci et al., 2017).

Adequate knowledge of the complications of diabetes is a prerequisite for reducing risk factors and preventing the consequences of the disease, which leads to eliminating the risk of developing complications of the disease (Afaya et al., 2020).

2.5.1 Management digital health technology

Mobile health tools (also known as "mHealth") are becoming increasingly significant in the management and prevention of diabetes as a result of the widespread availability of smartphones and developments in medical technology Educating people with type 1 and type 2 diabetes about the disease, how to take care of themselves, and how to prevent complications is only one of the many purposes and characteristics of today's mobile health therapies There is a need for more studies into the impact of demographic, socioeconomic, behavioral, and clinical factors on the efficacy of mobile health tools for diabetes control (Shan et al., 2019).

2.5.2 Acupuncture Point Therapy

Manual acupuncture, electro-acupuncture, moxibustion, external application, acupuncture point injection, and integrating drops are only a few of the many treatments used in Traditional Chinese Medicine that are based on the notion of acupuncture points and meridians Managing diabetes and the common chronic complications it causes with the help of acupuncture has been proven to offer remarkable therapeutic effects and advantages In isolation or in conjunction with Western medicine, it produces better results with fewer unwanted side effects Research into the mechanism may yield insights that can be applied in the clinic Zhongwan (KI36), Zusanli (ST36), Shenshu (BL23), Sanyinjiao (SP6), Yishu (EX-B3), and Zusanli (KI36) are the acupuncture sites with the greatest research into their effects on nerve conduction, signaling pathways, hormone levels, protein formation, oxidative stress, structural restoration, etc (CV12) Studies on diabetic mice models have been used rather than human volunteers for the majority of research. The mechanisms of acupoint therapy for treating other chronic conditions, such as diabetic retinopathy, and the mechanisms of other therapeutic methods, such as applying pressure on the ear with beans, treating auricular points with gypsum, and external application, are also unknown (Feng et al., 2018).

2.5.3 The Spices

The use of herbs and spices in cooking is a part of the traditional dietary treatment of diabetes. Antioxidant, anti-inflammatory, and anti-diabetic qualities of the spice have been recognized for a long time. Common spices like cinnamon, ginger, turmeric, and cumin can help prevent and manage diabetes and its complications (Bi et al., 2017).

2.6 Management of IDDM

Physiological and behavioral factors combine to make type 1 diabetes management challenges Although frequent exercise is helpful for people with type 1 diabetes, it can be challenging for the individual and their healthcare practitioner to keep track of all the many forms of physical activity that the individual engages in Many persons with type 1 diabetes are overweight and don't get the 150 minutes of moderate to the intense aerobic activity they should each week. This makes them at least as inactive as the general public. There are several positive health outcomes connected with regular exercises, such as weight maintenance, better body composition, increased fitness, and lower glucose levels. A person with diabetes may confront a number of additional hurdles to exercise, including fear of hypoglycemia, a loss of glycemic control, and a lack of information regarding exercise management Including adjustments to the diet and insulin dosage to counteract glucose loss during exercise (Riddell et al., 2017).

2.7 Management of NIDDM

Increased therapy options for type 2 diabetes mellitus (T2DM) have paralleled increases in our understanding of the pathophysiologic defects that rise to this disease It is essential to have a patient-centered approach to managing type 2 diabetes that considers factors beyond glucose management, such as reducing the patient's risk of cardiovascular disease. Monotherapy, with metformin as the preferred medicine, is recommended as first-line treatment for type 2 diabetes by both the American Diabetes Association and the American Association of Clinical Endocrinologists/American College of Endocrinology Glycemic efficacy, safety profiles, weight and hypoglycemia risk, tolerability, patient comorbidities, route of administration, patient preference, and cost are all important considerations when choosing a therapy While medication effects on weight and the risk of hypoglycemia are both important, the capacity of individual pharmaceuticals to modify cardiovascular outcomes has received less attention in US-based T2DM recommendations. The reason for this is that it was unknown whether or not specific glucose-lowering drugs altered cardiorenal outcomes until quite recently There have been a number of recent studies looking at the effects of empagliflozin on cardiovascular outcomes in patients with type 2 diabetes mellitus, including the Trial to Evaluate Cardiovascular and Other Long-term Outcomes with Semaglutide in Subjects with Type 2 Diabetes 6 (SUSTAIN-6), the Liraglutide Effect and Action in Diabetes: Evaluation of Cardiovascular Outcome Results (LEADER) trial and the Empagliflozin Cardiovascular Outcome Event Trial Empagliflozin is also the first glucose-lowering medicine approved to reduce the risk of cardiovascular death in those with type 2 diabetes and prior cardiovascular disease Patients with suboptimally managed long-standing T2DM and established atherosclerotic cardiovascular disease are now included in the 2017 American Diabetes Association guidelines that recommend adding empagliflozin or liraglutide to standard therapy to minimize cardiovascular and all-cause mortality (Thrasher, 2017).

2.8 Management of Gestational Diabetes Mellitus

Worldwide, more and more pregnant women are developing diabetes. The strain on healthcare systems can be lessened and long-term implications avoided if pathological hyperglycemia is avoided during pregnancy. How well dietary supplements and pharmaceutical methods work to ward off this illness. There is considerable variation between experiments, making it difficult to provide a broad recommendation. There is no reduced risk of GDM in population studies of combined dietary or lifestyle factors, and the outcomes of research using physical activity intervention are mixed. Although nutritional changes in obese pregnant women have been shown to minimize fetal macrosomia, studies looking at the effects of increasing women's physical activity levels have shown minimal compliance and no significant decrease in the prevalence of gestational diabetes mellitus. Probiotic and minositol supplements have been shown to lower GDM incidence, but more evidence is needed to draw strong conclusions. There are high-risk populations for type 2 diabetes for whom metformin has not been shown to be effective in preventing the disease in randomized controlled studies. Given the promising potential for easing illness burden, more study is required to determine which methods will work best at the population level (Agha-Jaffar et al., 2016).

3 MATERIAL AND METHODS

3.1 Design

This is a descriptive cross-sectional study.

3.2 Sample and preparation

The study was conducted with nurses working in Al-Karama Teaching Hospital and Al-Zahra Teaching Hospital in Wasit Province The study scientist consisted of 70 male and female nurses working at Al-Karama Teaching Hospital and Al-Zahra Teaching Hospital. The study sample consisted of 60 nurses who agreed to participate in the study.

Forty nurses from Al Karama Teaching Hospital and twenty nurses from Al Zahra Teaching Hospital participated in the study. The excluded samples were those who completed less than 80% of the survey and who did not respond to the questionnaire even after completing the questionnaire.

3.3 Data collection tools

The tools were selected in two parts; Data were collected using a three-section questionnaire developed to determine nurses' knowledge and attitudes about type 2 diabetes and a questionnaire to determine nurses' sociodemographic characteristics.

3.3.1. Questions on topics about basic knowledge of diabetes, acute and chronic related diseases, complications of diabetes, basic rules of nutrition, lifestyle treatment, oral hypoglycemia, factors, insulin therapy, and diabetes goals. The form consists of three sections collected using a 59-item questionnaire, consisting of 29 multiple-choice questions with the best answer, 22 “true” and “false” questions, and eight “open-ended” questions.

Questionnaires were distributed directly to all nurses working on diabetes The necessary permissions were obtained from him personally for implementation (Appendix 1) From (Abduelkarem & El-Shareif, 2013) “Knowledge Assessment Form” for nurses.

3.3.2. Sociodemographic Questions for Nurses Participants were asked for information about their age, gender, nationality, educational background, years of work experience, and their current workplace as well as whether they had any personal or first-degree family history of diabetes and medications used.

3.4 Data collection method

Data were collected using the questionnaire and interview methods The average data collection time was 15 minutes

search variables

The dependent variable was; Nurses' level of knowledge of type 2 diabetes, risk factors, and symptoms.

The independent variables were; Age, gender, nationality, educational level, years of work experience, and their current place of work, etc...

3.5 Data Analysis

Data were entered in statistical software version 26. In the descriptive statistics section, descriptive indicators such as mean, standard deviation, dependent t-test and ANOVA were applied.

3.6 Ethical dimension

Ethical approval was obtained from the Ethics Committee of the Scientific Research Committee at the Ministry of Health, Wasit, to conduct the research No.: 214 dated 04-18-2022 (Appendix 3).

4 RESULTS

This chapter presents the finding of the data analysis in tables and their correspondence with the objectives of the study.

Table 4.1 distribution of the nurses' staff in Wasit province hospitals / Iraq basis of by their Demographic information

Demographic data	Valid	F	%
Years of experience	Less than 1 years	13	21.7
	1 to 5 years	9	15.0
	6 to 10 years	8	13.3
	More than 10 years	30	50.0
	Total	60	100.0
μ± S. d: 13.47±11.317			
Gender	Male	36	60.0
	Female	24	40.0
	Total	60	100.0
work department	Pulmonary resuscitation unit	6	10.0
	Intensive care units	1	1.7
	Cardiac care unit	35	58.3
	Diabetic foot care unit	11	18.3
	Respiratory care unit	7	11.7
	Total	60	100.0
Age	20 to 25 years	14	23.3
	26 to 30 years	11	18.3
	31 to 35 years	7	11.7
	36 to 40 years	6	10.0
	More than 40 years	22	36.7
	Total	60	100.0
μ± S.d: 35.7±10.87			
Education level	High school of nursing	28	46.7
	Diploma of nursing	20	33.3
	Bachelor of nursing	12	20.0
	Total	60	100.0
Are you diabetic?		F	%
No		56	93.4
Yes		4	6.7
Total		60	100.0

If yes, the treatment?		
Type treatment		F
Daunil treatment		2
Glucophage treatment		1
Insulin		1
Total		4
Do you have diabetic relative?	F	%
No	37	61.7
Yes	23	38.3
Total	60	100.0
If yes, the treatment?		
Type treatment		F
Amerli treatment		2
Clocovance treatment		1
Daunil treatment		3
Glucophage treatment		2
Glucophage and daunil treatment		5
Good nutrition		2
Insulin		4
Metoformin treatment		4
Total		23

S.d: standard deviation, μ: mean, F: frequency, %: percent

The results showed that the mean of years of experience for nurses' staff was 13.47 years, with standard deviation was 11.317. The finding showed 21.7% of nurses were less than 1 year of experience, while 50% of nurses were more than 10 years, the majority of gender nurses' staff was male (60.0%) from nurses' staff,

the majority of work department for nurses staff was (58.3%) in cardiac care unit, 18.3% worked in diabetic foot care unit, 11.7% worked in respiratory care unit, 10% worked in pulmonary resuscitation unit, and 1.7% were worked in intensive care units, the mean of age for nurses' staff was 35.7±10.8 years, the majority of education level for nurses' staff was high school of nursing (46.7%), while 33.3% were diploma of nursing and 20% were bachelor of nursing, the majority of the diabetic nurses' staff did not have diabetes (93.4%), the majority of diabetic relatives of the nursing staff did not have diabetes 61.7% (37 nurses).

Table 4.2 distribution of diabetes-related knowledge among nursing staff in Wasit province hospitals / Iraq

Diabetes-related knowledge among nursing staff		F	%
Valid	Bad	6	10.0
	Moderate	27	45.0
	Good	27	45.0
	Total	60	100.0

F: frequency, %: percent

The results showed that the diabetes-related knowledge among nursing staff was 45.0% moderate and 45% good knowledge, while 10% with bad knowledge.

Figure 4-1 distribution of diabetes-related knowledge among nursing staff in Wasit province hospitals / Iraq

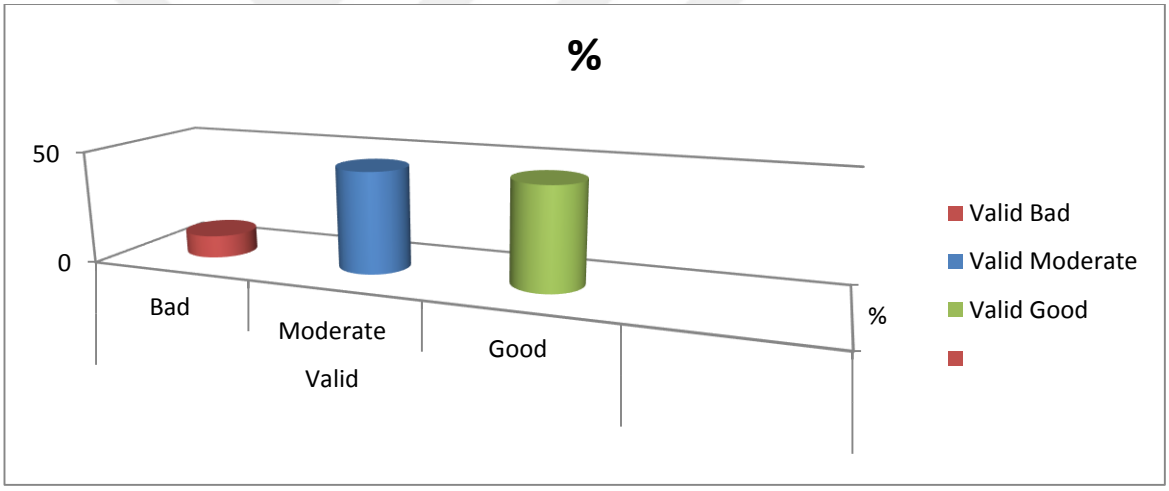

Table 4.3 distribution of the nurse's knowledge in Wasit province hospitals / Iraq

Level of nurses' knowledge		F	%
Valid	Low	5	8.3
	Moderate	17	28.3
	High	38	63.3
	Total	60	100.0

F: frequency, %: percent

The results showed that the Level of nurses' knowledge was 63.3 % with high knowledge, 28.3% with moderate knowledge, and 8.3% with low knowledge.

Figure 4-2 distribution of the nurse's knowledge in Wasit province hospitals / Iraq

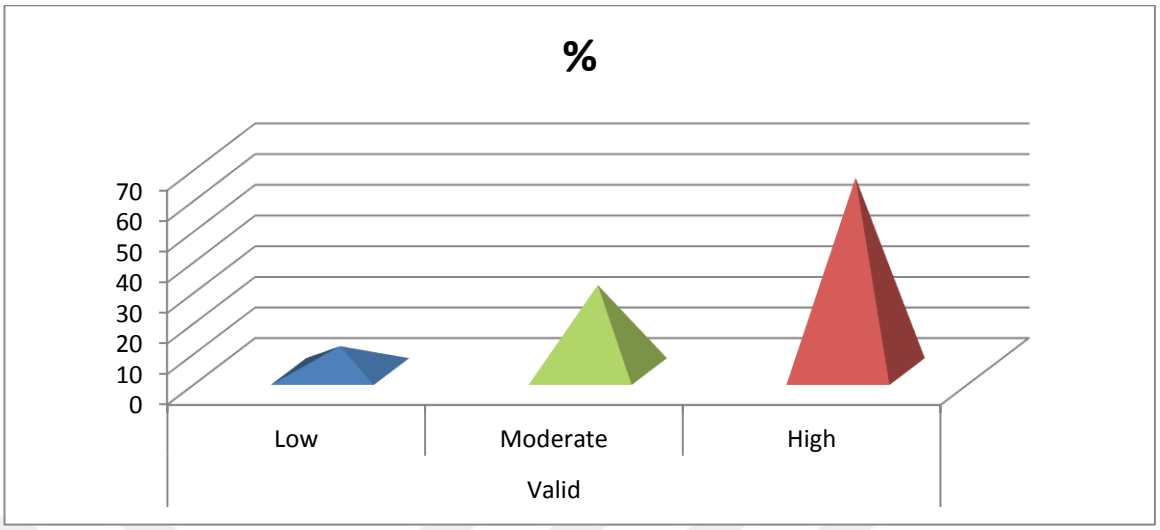

Table 4.4 the relationship between gender and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

	Gender	N	μ	F	P-value
Diabetes knowledge for nursing staff	Male	36	2.5278	.014	**.009**
	Female	24	2.0833		

N: number of samples, μ: mean, F: distribution, P-value: Probability, *Independent Samples Test, high significant at the 0.01 level

The results showed statistically significant between gender and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq (p-value = 0.009; p-value < 0.01).

Table 4.5. distribution the correlation between department and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

Diabetes knowledge for nursing staff		
Department	F	P-value
	3.387	**.015**

F: distribution, P-value: Probability, * ANOVA test, significant at the 0.05 level

The results showed a significant correlation between department and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq (p-value = 0.015; p-value < 0.05).

Table 4.6 distribution the correlation between age and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

Diabetes knowledge for nursing staff		
Age	F	P-value
	1.674	0.169

F:distribution , P-value: Probability, * ANOVA test, significant at the 0.05 level

The results showed not significant between age and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq (p-value = 0.169; p-value > 0.05).

Table 4.7 distribution the correlation between education level and diabetes knowledge for nursing staff working in hospital of Wasit city / Iraq

Diabetes knowledge for nursing staff		
Education level	F	P-value
	1.179	0.315

F:distribution , P-value: Probability, * ANOVA test, significant at the 0.05 level

The results showed not significant between education level and diabetes knowledge for nursing staff working in hospital of Wasit city / Iraq (p-value = 0.315; p-value > 0.05).

Table 4.8 distribution the correlation between years of experience and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

Diabetes knowledge for nursing staff		
Years of experience	F	P-value
	1.432	0.243

F:distribution , P-value: Probability, * ANOVA test, significant at the 0.05 level

The results showed not significant between years of experience and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq (p-value = 0.243; p-value > 0.05).

Table 4.9 The relationship between relative diabetic and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

Do you have diabetic relative?	N	μ	F	P-value
Yes	23	2.2174	2.650	0.222
No	37	2.4324		

N: number of samples, μ: mean, F:distribution P-value: Probability, *Independent Samples Test

The results showed not significant between elative diabetic and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq (p-value = 0.222; p-value > 0.05).

Table 4.10. The relationship between nurses with diabetic and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

Are you diabetic?	N	μ	F	P-value
Yes	4	2.25	2.09	0.756
No	56	2.35		

N: number of samples, μ: mean, F:distribution P-value: Probability, *Independent Samples Test

The results showed not significant between nurses with diabetic and diabetes knowledge for nursing staff working in hospitals of Wasit city / Iraq

(p-value = 0.756; p-value > 0.05).

5 DISCUSSION

In this section, the results obtained from this study to assess the level of knowledge about type 2 diabetes among nurses and methods for determining treatment with knowledge of type 2 diabetes in light of the literature are discussed.

According to this study, we used a structured questionnaire to survey a large number of nursing professionals in order to analyze their knowledge, reveal their skills, and motivate them to do better. The participants in this study were male and female in order to increase their knowledge of type 2 diabetes and its treatment with insulin more effectively. The research sample was divided into two hospitals in Wasit Governorate in central Iraq, and the number of samples was 60 samples from Al Karama Teaching Hospital 40 samples, and Al Zahra Teaching Hospital 20 samples. The study showed that 50% of the nurses who answered the questionnaire had more than 10 years of experience, and the average years of experience for nursing workers is 13.47 years and this result is similar (Alshammari et al., 2021)Their years of experience in clinical diabetes care extend from 2 to 21 years Most of them have more than 10 years of experience in diabetes care. The results of our study showed that the majority of the samples were males (60.0%), and this result is similar to the study (Alotaibi et al., 2017). The results showed that most of them worked in the heart care unit (58.3%) and that most of the samples were over the age of forty with 36.7% of the majority of the educational sample, and this result is similar to the study (Alshammari et al., 2021) as their ages ranged between 30 and 66 years, and the level of the nursing staff was secondary nursing with an average (46.7%) and this result differs from the study (Alshammari et al., 2021) Nurses' qualifications ranged from a nursing diploma to a master's degree. The results showed that the majority of the samples did not have diabetes (93.4%), and the majority of relatives of the nursing staff did not have diabetes by 61.7% (37 nurses). These results are similar to the study of (Abduelkarem & El-Shareif, 2013) where the results showed that 47 of the samples did not have diabetes. They do not have a ratio of 40.5.

The results also showed that the knowledge related to diabetes among the nursing staff was good knowledge by 45%, and reached the level of 63.3% high knowledge and this result is similar to the results of the study (Alotaibi et al., 2017) where their actual knowledge scores ranged from 2 to 35 with an average (SD) score 25.4 (6.2) (maximum 49) .

The results showed statistical significance between nurses' knowledge of type 2 diabetes trend and gender (P = 0.009; P < 0.01) and this result is similar to the results of the study (Alotaibi et al., 2017) The extent to which nurses believe they understand diabetes and how well they know depends on their demographic background. These variables, along with gender, were significantly associated with actual diabetes knowledge scores.

The results showed a significant relationship between nurses' knowledge of type 2 diabetes and the workplace (department) (P = 0.015; P < 0.05) and this result is similar to the results of the study (Alotaibi et al., 2017) Their knowledge on their background of cognitive acquisition from practice and similar to the results of a study, and study(Gossain et al., 1993) assessment of actual knowledge through the diabetes basic knowledge test There was a direct relationship between the knowledge of community nurses and hospitals who are fairly qualified in the field of diabetes and have a realistic perception of lack of knowledge They have it because there is no diabetes department.

The results showed that there were no statistically significant differences between nurses' knowledge and age (P = 0.169; P < 0.05), and this result is similar to the results of the study (Alotaibi et al., 2017) where it indicated equal knowledge between age groups, so the study (Lange & Pearce, 2017) Provide safe diabetes care for age.

The results showed that there was no significant difference between the education level and knowledge of diabetes for nursing workers (p=0.315; p<0.05) and this result is similar to the results of a study(Chan & Zang, 2007) Statistically significant differences were found between clusters. Overall, the nurses' perceived knowledge about diabetes was statistically significant correlated with actual knowledge (rs = 0 32). As in the study (El-Deirawi & Zuraikat, 2001) Similar to our study, actual and perceived knowledge of

nurses was positively correlated (r = .402, p < .0001). A rate of 72.2% was obtained and this result is similar to the results of a study(Yacoub et al., 2014) The nurses' actual knowledge of diabetes was positively correlated with their perceived knowledge, perceived competence, and level of education.

The results showed no significance between the nurses' years of experience and knowledge of type 2 diabetes (P = 0.243; P < 0.05) and this result is similar to the results of a study (Alotaibi et al., 2017) The percentage of knowledge varied by practice, and nurses generally had a positive view of their knowledge of diabetes , as in Study (Drass et al., 1989), A in contrast to our study in which a convenient sample of 184 professional nurses from the hospital was surveyed. A somewhat low negative correlation (r = -36, P < .001) indicates that nurses' knowledge is inversely related to actual knowledge.

The results showed not significant between relative diabetic and diabetes knowledge for nursing staff (p-value = 0.222; p-value > 0.05) This result differs from the result of a study (Abduelkarem & El-Shareif, 2013) where they had (47) of the volume of The sample had an average of 40.5% and the sample knowledge rate had their mean score 51.7 ± 25.5 (P > 0.05) as in the study (Odili & Eke, 2010) similar to our study as the mean score was 61.9 ± 14.24 (p < 0.05) There was a statistical difference in the knowledge scores of the nurses who They have a family history of diabetes.

The results showed not significant between nurses with diabetic and diabetes knowledge for nursing (p-value = 0.756; p-value > 0.05) This result differs from the result of a study (Odili & Eke, 2010) Where there was a statistical difference in the knowledge scores for the nurses with a with a family history of diabetes (P < 0.05).

6 CONCLUSION

According to the results of the study, a greater percentage of nurses have the ability to recognize and diagnose type 2 diabetes, as well as know the signs and symptoms of the condition and the ability to estimate the possibility of complications, and the study also confirms that some health workers need to increase their knowledge but are not motivated to do so Lead to reduce the chances of developing diabetes and reduce complications and human consumption.

6.1 Recommendations

We recommend raising awareness among nurses by training all medical staff, holding multiple and periodical courses, making posters and TV shows, and showing them to all nursing staff working in all hospitals to increase their knowledge of type 2 diabetes and insulin therapy and its clarification to reduce life-threatening risks.

We have recommended a number of effective recommendations, the most important of which are:

1. It is crucial that nurses participate in ongoing education to support their knowledge of complex clinical illnesses like diabetes.

2. Improving nurses' knowledge first requires ensuring that evidence-based diabetes care guidelines are adequately implemented and disseminated throughout the nursing community.

3. The importance of discussing the treatment plan for type 2 diabetes patients in general in a periodic meeting that includes all the different medical specialties to determine the appropriate treatment methods for each patient.

4. Strengthening relations between those who treat and strengthening relations with researchers to obtain the best results and providing moral support to patients, which affects the patient's treatment and increases the person's recovery rate from the disease.

5. In order to ensure that nurses have a high level of knowledge to impart to diabetic patients, a curriculum for their continuing professional development should be

developed. Spreading health awareness and conducting awareness campaigns in other medical departments about the dangers of type 2 diabetes.

6. There is an immediate need for strategies to overcome the identified obstacles to knowledge acquisition.

7. A large knowledge gap between the participants' perceptions and their actual levels of experience in this field.

8. Indicators for ways in which nurses' knowledge of diabetes can be improved are provided by the presence of factors that predict high levels of knowledge already possessed by the nurses.

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APPENDIX

APPENDIX 1. Questionnaire

APPENDIX 2. Ethics committee in Dhi Qar health department in Iraq approval

APPENDIX 3. Ethics committee in Çankiri Karatekin approval

APPENDIX 1. Questionnaire

Answer the following: -

APPENDIX 2 Ethics committee in Wasit health department in Iraq approval

APPENDIX 3 Ethics committee in Çankiri Karatekin approval

CURRICULUM VITAE

Personal Information

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