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The Relationship Between Drug Addicts Marijuana Type THC and Type Amphetamine AMP with Diabetes

A Research

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Degree of Higher Diploma in Science / Forensic Evidence

By

Hind Fadel Hussein Ali

B.Sc.Biology─ University of Baghdad (2003)

Supervised by

Ass. Prof.

Dr.Azhar Hamza Hassan Kadhum

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بِسْمِ اللَّـهِ الرَّحْمَـٰنِ الرَّحِيمِ

﴿عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ۝﴾

صدق الله العلي العظيم

سورة العلق (الآية1)

Certification

I certify that this Research was prepared under my supervision at the department of Biology, College of science, University of Babylon, as a partial requirement for the Degree of Higher Diploma of in Forensic Evidence.

Signature:

Name: **Asst . Dr.Azhar Hamza Hassan Kadhum**

Date:

In view of available recommendation, I forward this thesis for debate by the Examination Committee.

Signature:

Name: Asst. Pro.Dr.Adi Jassim Abd AL-Razzaq

Title: Head of Biology Department

Date:

Committee Certification

We, the examining committee, certify that we have read the research entitled (***The relationship between drug addicts Marijuana type THC and type Amphetamine AMP with diabetes***) and examined the student

(***Hind Fadel Hussein Al-tamemy***)

in its contents and that in our opinion it is accepted as a thesis for degree of ***High Diploma*** in ***Forensic evidence*** with (……..) Degree.:

Signature:

Professor

Dr. Mohammed Abdullah Jebor

College of science / University of Babylon

Data: / /2021

(chairman and member)

Signature:

Assist Prof.

Dr.Anwar Ali Abdulla Al-Hussainy

College of science / University of Babylon

Data: / /2021

(Member)

Signature:

Assist Prof.

Dr.Azhar Hamzah Hasan Kadhum

College of science / University of Babylon

Data: / /2021

(member and advisor)

Signature:

Prof. Dr.Enass Mohammed Al-rubaie

Dean of College of science / University of Babylon

Data: / /2021

Dedication

To my family

To my dear father ,to my compassionate Mother

To my dear brothers and sisters

To my dear husband and lovely kids

& My friends and who help me in this work

Hind

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First of all, I thank Allah who game me support to fulfill these part research ., from the depths of my heart.

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Hind/2021

Summary:

This study was conducted to detect the effect of Marijuana type THC and type Amphetamine AMP on diabetics. Blood samples were collected from sixty 60 patients from Al-Sadr Medical City in Najaf city. These samples were used to measurement the random blood sugar: 40 blood samples from patients (drug addicts which infected with DM) and 20 healthy individuals were included as control group. During this study, the correlation between blood sugar level and effect of drugs were assessed by correlational statistical analysis.

Blood samples were obtained and the sera were separated and check Random Blood Sugar (RBS) levels ,it was found in seven groups. In one group serum level of RBS was significantly higher in patients with DM than control group ($P \leq 0.001$).In two group serum level of RBS was significant in patients with DM than control group ($P=0.039$). In three group serum level of RBS was no significantly in patients with DM than control group ($P = 0.120$).In four group serum level of RBS was no significant in patients with DM than control group ($P = 0.786$).In five group serum level of RBS was no significant in patients with DM than control group ($P = 0.665$).In six group serum level of RBS was significant in patients with DM than control group ($P =0.013$).In seven group serum level of RBS was no significant in patients with DM than control group ($P = 0.321$).

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Abbreviation	Meaning
DM	diabetes mellitus
BMI	body mass index
CB	Cannabinoids
ECs	endothelial cells
FPG	fasting plasma glucose tests
HbA1c	Glycated haemoglobin
HLA	Human Leukocyte Antigen
IFG	impaired fasting glucose
IGT	impaired glucose tolerance
NLR	neutrophil-to-lymphocyte ratio
OGTTs	oral glucose tolerance tests
RBCs	red blood cells
RBS	Random blood sugar
SMCs	smooth muscle cells
SOC	standard of care
T1DM	type 1 diabetes mellitus
T2DM	type 2 diabetes mellitus
THC	Tetrahydrocannabinol

Chapter One

Introduction

1.Introduction

Diabetes Mellitus is a chronic metabolic disorder characterized by impairment in metabolism of carbohydrates, lipids, protein and high blood glucose level. It is caused due to defect in insulin secretion by pancreas or due to ineffective response of cell to the insulin production. Insulin is secreted by β cells of Islets of Langerhans which is important in controlling blood glucose concentration by facilitating uptake of glucose and peripheral tissues metabolism (Bayonets, 2015).

Diabetes mellitus disease was considered as a global epidemic, in Iraq the incidence rate was increasing. Diabetes is widely recognized as an emerging epidemic that has a cumulative impact on almost every country, age group, and economy across the world. According to the International Diabetes Federation, in 2015, approximately 415 million people were suffering from diabetes worldwide, and this number is expected to exceed 640 million by the year 2040 (Atlas,2015).

Diabetes complications are common among patients with type 1 or type 2 diabetes but, at the same time, are responsible for significant morbidity and mortality .The Centers for Disease Control and Prevention estimate that 18.8 million people in the USA over the age of 20 years have been diagnosed with diabetes and that another 7 million have diabetes but remain undiagnosed (Deshpande *et al.*,2008;C.D.C., 2011).

Undiagnosed diabetes is particularly concerning, because careful management of diabetes, in terms of eating healthy, remaining active, and taking appropriate medications, has been shown to reduce the risk of adverse events, including myocardial infarction, cerebrovascular accident, end-stage renal disease, blindness, foot ulceration, and amputation (Boyle *et al.*, 2010).

Illicit drug use contributes significantly to the global burden of disease, and thus is considered an emerging public health problem (U.N.O.,2010;Asante.,2019).

Marijuana is known to cause a series of acute effects for the users such as anxiety, impaired attention and short-term memory loss, as well as attenuated motor coordination, which pose risks in public settings, such as traffic accident. For longterm marijuana users, the impairment on cognition and memory could be prolonged and irreversible . Once heavy marijuana users stopped it's intake, they often experience persistent withdrawal symptoms such as nausea, insomnia and depression . If not properly regulated, use of marijuana would cause tremendous social crisis and economic loss. Therefore, almost all countries have strict laws regulating use and usage of marijuana. Epidemiological studie have linked decreased diabetes incidence with the use of cannabinoid (Hall & Degenhardt,2009).

Aim of study:-

The present work aimed at the relationship between drug addicts Marijuana type THC and type Amphetamine AMP with diabetes.

The objectives of this work are:-

1.Collection of samples from diabetes patients.

2.Selection of diabetic drug addicts patients.

3.Detect the effect of Marijuana type THC and type Amphetemine AMP on diabetics.

Chapter Two

Literatures Review

2.2. Literature review

2.2.1. General characteristics of diabetes mellitus

Diabetes is a group of diseases that is characterized by a high concentration of blood glucose. This is caused by the decrease or complete depletion of insulin secretion from beta cells in the pancreas, poor uptake of glucose by cell (insulin resistance), or both. This results in non-natural carbohydrates, proteins and fat metabolism .Symptoms involve hyperglycemia, polyuria, polydipsia, and polyphagia. If patient not properly treated, diabetes may cause many complications . Primary complications include hyperosmolar hyperglycemic state, diabetic ketoacidosis (hypoglycemia), or death .Secondary complications include stroke, cardiovascular disease, Diabetic foot ulcer, chronic kidney disease, and Diabetic retinopathy (Kitabchi *et al.*, 2009); (Saleh, 2011).

Chronic non-transmissible diseases represent a major problem in the world, being the main cause of death today .Diabetes mellitus is one of the most worrying chronic diseases for its major economic and social impact, reported as responsible for 11.6% of the health care expenses worldwide in 2010. According to the World Health Organization, in 2014, a total of 422 million adults had diabetes and in 2012 there were 1.5 million deaths caused by this illness (Ministry of Health of Brazil, 2010);(W.H.O., 2016).

Diabetes mellitus is defined as a syndrome caused by several etiologies and is characterized by a metabolic dysfunction with a degenerative potential that involves energetic sources resulting from changes in the production, secretion and/or inability of the insulin to adequately exercise its effects. It is a chronic condition that requires the subjects living with the illness to have a continuous self-management of the lifestyle and adaptation to the illness (American Diabetes Association, 2009).

Diabetes mellitus is often considered a silent illness and linked to poor health care. In fact, 46.5% of the affected people are unaware of their condition . Thus, the news of having diabetes is often abrupt and may be accompanied by feelings of denial and/or difficulty in the treatment participation, which involves important changes in lifestyle (W.H.O., 2012).

2.2.2. Classification of diabetes mellitus

Diabetes mellitus type 1, also known as type 1 diabetes, is a form of diabetes mellitus in which very little or no insulin is produced by the pancreas .TIDM, previously known as insulin dependent diabetes or juvenile onset diabetes is an autoimmune disorder that involves the destruction of the B cells by activated CD4+ and CD8+ T cells and macrophages infiltrating the pancreatic islets. The onset of TIDM usually occurs in childhood and early adulthood (<35 years). Genetic as well as environmental factors are known to contribute to the susceptibility to this diabetes (W.H.O., 2013).

Type 2 diabetes mellitus (DM) is a chronic metabolic disorder in which prevalence has been increasing steadily all over the world. As a result of this trend, it is fast becoming an epidemic in some countries of the world with the number of people affected expected to double in the next decade due to increase in ageing population, thereby adding to the already existing burden for healthcare providers, especially in poorly developed countries (Olokoba *et al.*,2012).

2.2.3. Epidemiology of diabetes mellitus

The incidence rate of type 1 diabetes varies widely around the world and depends on the interaction between genetic susceptibility and certain environmental factors. Recently, it has been demonstrated that low socioeconomic status is associated with

higher morbidity and mortality rates for patients with type 1 diabetes mellitus (T1DM) (Scott *et al.*,2017).

The application of epidemiology to the study of DM has provided valuable information on several aspects of this disease such as its natural history, prevalence, incidence, morbidity and mortality in diverse populations around the world. Identification of the cause of the disease and the possible preventive measures that could be instituted to arrest or delay the onset of this disease which has reached epidemic proportions in both the developed and the developing nations. Unfortunately, the improvement in outcomes for individual patients with diabetes has not resulted in similar improvements from the public health perspective (Baynest, 2015).

The worldwide prevalence of diabetes has continued to increase dramatically. Globally, as of 2011, an estimated 366 million people had DM, with type 2 making up about 90% of the cases .The number of people with type 2 DM is increasing in every country with 80% of people with DM living in low- and middle-income countries (Chen *et al.*, 2014).

Literature search has shown that there are few data available on the prevalence of type 2 DM in Africa as a whole. Studies examining data trends within Africa point to evidence of a dramatic increase in prevalence in both rural and urban setting, and affecting both gender proportionally. According to the World Fact book report in 2008, in Africa the prevalence of diabetes mellitus was 3.2%, and 40,895 persons (2.0%) was in Ethiopia (C.I.A., 2008);(Diabetes Mellitus Interagency Coordinating Committee, 2014).

Iran and Saudi Arabia are two of the 19 countries and territories of the IDF MENA region. 425 million people have diabetes in the world and more than 39 million people

in the MENA Region; by 2045 this will rise to 67 million. There were total cases of diabetes in Iran and Saudi Arabia adults 4.985.500 and 3.852.000 case respectively and prevalence of type 2 diabetes adults was 8.9% and 18.5% respectively in 2017. In Iraq, a total cases of diabetes in adults 1,411,500 case and prevalence of type 2 diabetes in adults was 7.5% in 2017 (I.D.F., 2017b).

Although T2DM is widely diagnosed in adults, its frequency has markedly increased in the pediatric age group over the past two decades. Depending on the population studied, T2DM now represents 8-45% of all new cases of diabetes reported among children and adolescent .The prevalence of T2DM in the pediatric population is higher among girls than boys, just as it is higher among women than men (Ali *et al.*, 2013);(Temneanu *et al.*, 2016).

Prevalence of type 1 diabetes (T1D) disease is increasing worldwide. Type 1 diabetes mellitus, previously known as insulindependent diabetes, is a heterogeneous disorder that usually develops during childhood and adolescence. The disease is characterized by a deficit of insulin production secondary to destruction of pancreatic β-cells and requires lifelong administration of insulin for survival. Type 1 diabetes accounts for about 5% to 10% of all patients with diabetes. It is estimated that 1,106,500 people ages 0 to 19 years have type 1 diabetes worldwide, with 132,600 newly diagnosed cases each year (Fortunato *et al.*, 2016) ;(You and Henneberg, 2016); (I.D.F., 2017a).

The epidemic of diabetes mellitus and its complications poses a major global health threat. The International Diabetes Federation (IDF) estimated that 1 in 11 adults aged 20-79 years (415 million adults) had diabetes mellitus globally in 2015. This estimate is projected to rise to 642 million by 2040, and the largest increases will come from the regions experiencing economic transitions from low-income to middle-income levels (I.D.F., 2015). However, these estimates might have under-represented the true

global burden of diabetes mellitus, especially in regions undergoing rapid epidemiological transitions (Zimmet, 2017). The reasons for the escalating epidemic of diabetes mellitus are multiple, including population ageing, economic development, urbanization, unhealthy eating habits and sedentary lifestyles (Holman *et al.*, 2015). Strong evidence indicates that many cases of T2DM could be prevented by maintaining a healthy body weight, following a healthy diet, exercising daily for at least 30 min, avoiding smoking and consuming alcohol in moderation (Schellenberg *et al.*, 2013).

Genetic susceptibility is important but not sufficient in causation of type 1 diabetes. Environmental factors have a more important role in progression from islet autoimmunity to overt disease, possibly because improved living standards have reduced microorganism exposure, leading to increased autoimmunity (Cooper *et al.*,2011).

2.2.4. Signs and symptoms of diabetes mellitus

The signs and symptoms of diabetes are being polydipsia, polyuria, polyphagia, fatigue, weight loss without trying, slow healing of sores, dehydration, itchiness skin, foot numb, tingling or pain in the feet and blurred vision. Some people with diabetes don't have any of these signs or symptoms. The only way to know if you have diabetes is to have your doctor do a blood test .The signs and symptoms of diabetes are disregarded by many because of the chronic progression of the disease. People do not consider this as a serious problem because unlike many other diseases the consequences of hyperglycaemia are not manifested immediately. People are not aware that damage can start several years before symptoms become noticeable. This is unfortunate because recognition of early symptoms can help to get the disease under control immediately and to prevent vascular complications **(**Ramachandran, 2014**)**.

Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome. Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputations, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction. Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular disease. Hypertension and abnormalities of lipoprotein metabolism are often found in people with diabetes. The vast majority of cases of diabetes fall into two broad etiopathogenetic categories. In one category, type 1 diabetes, the cause is an absolute deficiency of insulin secretion. Individuals at increased risk of developing this type of diabetes can often be identified by serological evidence of an autoimmune pathologic process occurring in the pancreatic islets and by genetic markers. In the other, much more prevalent category, type 2 diabetes, the cause is a combination of resistance to insulin action and an inadequate compensatory insulin secretory response. In the latter category, a degree of hyperglycemia sufficient to cause pathologic and functional changes in various target tissues, but without clinical symptoms, may be present for a long period of time before diabetes is detected. During this asymptomatic period, it is possible to demonstrate an abnormality in carbohydrate metabolism by measurement of plasma glucose in the fasting state or after a challenge with an oral glucose load or by HbA1c. The degree of hyperglycemia (if any) may change over time, depending on the extent of the underlying disease process. A disease process may be present but may not have progressed far enough to cause hyperglycemia. The same disease process can cause impaired fasting

glucose (IFG) and/or impaired glucose tolerance (IGT) without fulfilling the criteria for the diagnosis of diabetes. In some individuals with diabetes, adequate glycemic control can be achieved with weight reduction, exercise, and/or oral glucose-lowering agents. These individuals therefore do not require insulin. Other individuals who have some residual insulin secretion but require exogenous insulin for adequate glycemic control can survive without it. Individuals with extensive β-cell destruction and therefore no residual insulin secretion require insulin for survival. The severity of the metabolic abnormality can progress, regress, or stay the same. Thus, the degree of hyperglycemia reflects the severity of the underlying metabolic process and its treatment more than the nature of the process itself (Karaa & Goldstein, 2015; A.D.A, 2014; Andersen *et al.*,2016).

Both types of diabetes have similar symptoms, but for T1DM is usually diagnosed in children, the symptoms develop more rapidly in days or weeks while in type 2 diabetes are insidious in onset. Because of its insidious onset, many patients with Type 2 DM have evidence of complications the time of diagnosis. Most cases are diagnosed because of complications or incidentally (Kumar and Clark, 2005).

Diabetes often goes undetected because symptoms can be attributed to many other causes and some patients experience no symptoms or fail to heed warning signs. Possible indicators of diabetes include excessive thirst (polydipsia), excessive urination (polyuria) and dehydration, excessive hunger or appetite (polyphagia), unexplained weight loss, blurred vision, nearsightedness or other vision problems, frequent infections including skin infections, thrush, gingivitis, urinary tract infections and yeast infections, slow healing of sores skin problems such as itchiness or acanthosis nigricans, fatigue, lethargy or drowsiness, shakiness or trembling, mood swings or irritability, dizziness or fainting and numbness, tingling or pain in the feet, legs or hands (Zhao *et al.*,2016).

Type 1 diabetes can develop rapidly and often occurs after an illness, but symptoms may be mistaken for the flu or other common conditions. Type 2 diabetes can take many years to develop and sometimes becomes apparent only after long-term complications occur, such as sexual dysfunction or leg pain that is due to diabetic neuropathy or claudication (caused by peripheral artery disease) Newton & Raskin, 2004).

Some people, especially young people with type 1 diabetes, go undiagnosed until they are brought to a hospital with an emergency condition called diabetic ketoacidosis. Indicators of diabetic ketoacidosis include sweet fruity-smelling or wine-smelling breath, confusion and heavy labored breathing (Kussmaul breathing). Sometimes patients are diagnosed with diabetes only after suffering other serious complications including insulin shock (severe hypoglycemia that is associated with the presence of excessive insulin in the system and that if left untreated may result in convulsions and progressive development of coma), hyperosmolar hyperglycemic nonketotic syndrome or diabetic coma.To help prevent such complications, people are advised to undergo periodic screening for diabetes with glucose tests, especially if they have risk factors (Samreen, 2009).

2.2.5. Historical and Diagnosis of diabetes mellitus

Glycated haemoglobin (HbA1c) assays give a retrospective index of the integrated plasma glucose over an extended period, usually 90-120 days. This period is, however dependent on the average red cell lifespan of the individual. Since its discovery in the 20th century, improvement in the analytical techniques for HbA1c have facilitated its wide acceptance as a useful tool in monitoring glucose control, and more recently, has been recommended for the diagnosis of diabetes mellitus (Ezegbogu and Abdulsalam, 2018).

Historically, HbA1c was first isolated by Huisman *et al.* in 1958 (Huisman *et al.*, 1958) and characterized by Bookchin and Gallop in 1968, as a glycoprotein (Bookchin and Gallop, 1968). The elevated levels of HbA1c in diabetic patients were reported by Rahbar *et al.* in 1969 (Rahbar *et al.*, 1969). Bunn *et al.* identified the pathway leading to the formation of HbA1c in 1975 (Bunn *et al.*, 1975). Using the HbA1c as a biomarker for monitoring the levels of glucose among diabetic patients was first proposed by Koenig *et al.* in 1976 (Koenig *et al.*, 1976).

The HbA1c is typically performed every three monthly with the notion that the concentration of glycated hemoglobin changes with the life span of the red blood cells which is approximately 120 days. It is therefore used as a clinical tool for monitoring of glycemic control in people with diabetes (Pluddemann *et al.*, 2011; English *et al.*, 2014).

A person without diabetes with his/her HbA1c test level ranging between 4% to 5.6% is considered normal; between 5.7% to 6.4% indicates a high risk of diabetes or pre-diabetes (Srivastava *et al.*, 2018).

Until recently, the diagnosis of diabetes mellitus was determined solely by glucose concentration on the basis of the results of two tests: two fasting plasma glucose (FPG) tests, two oral glucose tolerance tests (OGTTs), or one of each performed on separate days close together in time. In 1993, the Diabetes Control and Complications Trial established the importance of HbA1c as an indicator of risk for microvascular complications of diabetes, such as blindness, kidney disease, and nerve damage; however, it was not until 2009 that the International Expert Committee recommended use of HbA1c for diagnosis of diabetes (Gillett, 2009).

Analysis of glycated hemoglobin (HbA1c) in blood provides evidence about an individual's average blood glucose levels during the previous two to three months, which

is the predicted half-life of red blood cells (RBCs) (Khan and Weinstock, 2011). The HbA1c is now recommended as a standard of care (SOC) for testing and monitoring diabetes, specifically the type 2 diabetes (W.H.O., 2011).

Proteins are frequently glycated during various enzymatic reactions when the conditions are physiologically favorable. However, in the case of hemoglobin, the glycation occurs by the nonenzymatic reaction between the glucose and the N-terminal end of the β-chain, which forms a Schiff base (Marchetti, 2009; Ohtsubo *et al.*, 2011).

The formation of the glycated hemoglobin is a normal part of the physiologic function cycle. However, as the average plasma glucose increases, so does the amount of glycated hemoglobin in the plasma. This specific characteristic of the hemoglobin biomarker is utilized for estimating the average blood glucose levels over the previous two to three months (Khan *et al.*, 2014).

2.2.6. Immune system and diabetes mellitus

The main causes of morbidity and mortality in diabetes are macrovascular and microvascular complications. The pathogenesis of these complications is multifactorial, but there is strong evidence implicating chronic, smoldering, and inflammation as a main pathogenic event in the development of diabetic complications (Nguyen *et al.*, 2012).

Although the mechanisms responsible for vascular inflammation in diabetes are similar to those involved in vascular disease in non-diabetics ,chronic hyperglycemia and dysregulated immune responses in diabetes are responsible for the activation of inflammatory circuits, inducing oxidative stress and promoting insulin resistance, thus creating conditions that lead to the development of diabetes and diabetic complications (Nguyen *et al.*, 2012; Frostegard, 2013; Di Marco *et al.*, 2013).

Immune systems in vertebrate are divided into two basic categories: innate and adaptive immunity. The innate immune system is evolutionally conserved and is the first line of defense against invading microorganism while the adaptive immune system responds to the infections in a time-delayed but antigen-specific fashion. Specific cell populations of the innate immune system such as antigen-presenting dendritic cells (DCs) are critical in promoting primary T and B cells response and probably bridge the gap between innate and adaptive immunity . Innate immune recognition of pathogens is usually mediated by a set of germline-encoded receptors that have evolved to recognize conserved molecular patterns by large groups of organisms. Some studies have demonstrated that this recognition is mediated mainly through the TLR family members, which are stimulated by different microbial stimuli (Janeway & Medzhitov,2002).

Type 1 diabetes (T1DM) is a polygenic disorder where loci within the HLA (Human Leukocyte Antigen) account for most of genetic susceptibility. Non-genetic factors, most likely environmental, are also involved in the pathogenesis of the disease resulting in a T cell-mediated autoimmune attack against pancreatic beta cells. Although during the last decades our understanding of the natural history of T1DM has significantly improved , the pathogenesis of this disease remains elusive and successful strategies for primary intervention are still to come. Autoimmunity is the failure of an organism to recognize its own constituent parts as self, which allows an immune response against it's own cells and tissues. Any disease that results from such an aberrant immune response is termed an autoimmune disease. These systemic or organ-specific conditions are the results of multifactorial processes involving dysregulation of the innate and adaptive immune systems that lead the body to attack it's own tissues (Eizirik *et al.*,2009).

Type 2 diabetes mellitus (T2DM) is characterized by abnormally elevated levels of blood glucose due to impaired insulin secretion, glucose intolerance, and hyperglycemia. It is also considered as a major burden for healthcare systems worldwide .Nowadays, the pathogenesis of T2DM is considered to be linked to both innate and adaptive immune factors that are recognized as important etiological components in the development of insulin resistance .Epigenetic mechanisms controlling immune cell lineage determination, function, and migration are implicated in obesity and T2DM. Obesity is associated with low-grade inflammation and is responsible for the activation of immune system in patients suffering from T2DM (Goldberg, 2009; A.D.A, 2012; Richardson *et al.*, 2013).

Type 2 diabetes mellitus (T2DM) is characterized by impaired insulin secretion, glucose intolerance, and hyperglycemia. T2DM is widely viewed as a chronic, low-grade inflammatory disease caused by long-term immune system imbalance, metabolic syndrome, or nutrient excess associated with obesity (Guzmán-Flores and López-Briones, 2012; Shu *et al.*, 2012).

In addition, T2DM associated complications in the kidneys, arteries, and eyes are also manifested by inflammatory process .Therefore, inflammation is considered as a major driving force in T2DM and associated complications. Inflammation was first linked to insulin resistance and diabetes in the early 1990s (Guarner and Rubio-Ruiz, 2014).

Hotamisligil *et al.* reported an increase of TNF-α in adipose tissue from different animal models of obesity and diabetes. Neutralization of TNF-α in obese rats improved peripheral glucose uptake. Studies have indicated that other inflammatory cytokines such as IL-1β and IFN-γ which are increased in obesity and diabetes also modulate insulin signaling .On the other hand, a number of anti-inflammatory cytokines, such as IL-4 and

IL-10, have been associated with the protection of insulin sensitivity .Macrophages are the major inflammatory cell type in the glucose-utilizing tissues such as adipose tissue and liver .Therefore, early studies on inflammatory regulation of diabetes have been focused on innate immune function (Hotamisligil *et al.*, 1993; Odegaard *et al.*, 2007; Ouchi *et al.*, 2011; Mathis, 2013; Boutens and Stienstra, 2016).

Type 2 diabetes mellitus (T2DM) is characterized by abnormally elevated levels of blood glucose due to impaired insulin secretion, glucose intolerance, and hyperglycemia. It is also considered as a major burden for healthcare systems worldwide .Nowadays, the pathogenesis of T2DM is considered to be linked to both innate and adaptive immune factors that are recognized as important etiological components in the development of insulin resistance (Goldberg, 2009; A.D.A., 2012).

The macrophages and monocytes are the best studied, but recently has been reported the involvement of other type of cells; such as neutrophils, mast cells, eosinophils, dendritic cells, NKs, NKT. Also, some T cells subsets, such as Th1, Th2, T regulatory, Th17 and B cells seems to be involved in the low grade chronic inflammation .This review focuses on recent evidences of the role of innate immune system cells in the pathology of T2DM and diabetic foot ulcer (Guzmán-Flores and López-Briones, 2012).

Diabetes is recognized as an important risk factor for a variety of intracellular bacterial infections, but research into deregulated immune mechanisms contributing to alteration of host-pathogen interactions is not well understood. Diabetes is characterized by a chronic state of inflammation due to activation of pro-inflammatory mediators and increased formation of end products of advanced glycation. Increased oxidative stress also exacerbates chronic inflammatory processes seen in diabetes (Hodgson *et al.*, 2015; Ruiz-Miyazawa *et al.*, 2015).

2.2.7.Marijuana type THC and type Amphetamine AMP

Illicit drug use contributes significantly to the global burden of disease, and thus is considered an emerging public health problem . According to the United Nations Office on Drugs and Crime (UNODC), the global prevalence of illicit drug use (including amphetamines, cannabis, cocaine, opioids, etc.) (U.N.O,2010; Asante,2019.

The same report also indicated that cannabis, amphetamine-type stimulants, cocaine, and opioids were the most commonly used illicit drugs . In a South African population based survey conducted among individuals aged 12 years and older in 2012, past 3 month prevalence of illicit drug use was 4.4%. Illicit drug use contributes 2% to cause-specific disability adjusted life-years for young people aged 10 to 24 years globally (Gore *et al.*,2011; Shisana *et al.*,2014).

In the United States, epidemiological data showed that 42% of high school seniors had ever tried marijuana .In another study, nearly 1 in 4 of the English population (25%) reported ever using cannabis .A study in Thailand has shown that the overall prevalence of ever used illicit drugs was 6.0%.5 In Malaysia, the number of drug addicts detected from January to November 2012 was 4948, among whom 3.2% were adolescents aged < 18 years (Farrell & Marshall, 2006; Gray ,2007; Yusoff *et al.*,2014).

Marijuana is derived from the plant Cannabis sativa. Research into the composition and chemistry of cannabis has revealed that the plant contains 426 chemicals, 62 of which are cannabinoids .Marijuana is one of the most extensively abused illicit substances in North America, and it is important to determine it's

possible adverse health effects. A vital area of concern is the genetic toxicology of cannabis. During the past several years, research has been directed toward the question of the genetic effects of marijuana and its derivatives. A large number of studies have been carried out to assess the mutagenic capacity of cannabis, that is, it's ability to react with or damage DNA in both germinal (sex) cells and somatic (body) cells. Mutagenicity can be manifested by the induction of point mutations (DNA changes within a gene region) or the induction of structural changes within a chromosome (involving more than one gene region and referred to as chromosome abnormalities). The latter change implies the ability of a chemical to break chromosomes and act as a clastogen (Turner, 1985; Zimmerman & Zimmerman ,1990).

Marijuana is the most commonly used illicit drug in the United States and worldwide. Initiation of use typically occurs during adolescence. The most recent epidemiological data indicate that in the United States, 42% of high school seniors have tried marijuana, 18% have used it in the past 30 days, and 5% use it daily.Among adolescents aged 12 to 17, 3.6% met criteria for cannabis use disorder (abuse or dependence) and 2% met criteria for cannabis dependence.

2.2.8.Diabetec disease and drug addicts

Illicit drug use among adolescents has become a significant public health and social problem worldwide. According to the World Drug Report, the involvement of youth in licit and illicit substances globally is on the rise (U.N.O.,2007).

The prevalence of type 2 diabetes mellitus (DM) is increasing, and it is projected that in the USA alone, type 2 DM will increase to 48.3 million by 2050.1 In addition to

defects in pancreatic β-cell function and insulin sensitivity, systemic inflammation is thought to be involved in its pathogenesis (Hu *et al.*,2004; Narayan *et al.*,2006).

Marijuana is the most commonly used illicit drug in the USA and is currently used by 14.4 million Americans.The Cannabis sativa (marijuana) plant contains bioactive components termed cannabinoids (CB). The major psychoactive CB is delta 9-tetrahydrocannabinol (THC) whose effect is mediated through the CB1 and the CB2 subtypes of CB receptors found in the brain and lymphoid tissues. The endocannabinoids, a group of neuromodulatory lipids also bind to these receptors. Cannabis, THC and other CBs have been shown to have both beneficial and detrimental effects . Marijuana users have higher caloric intake while eating less nutrient-rich foods, yet have similar or slightly lower body mass index (BMI) than nonusers. We hypothesised that the prevalence of DM would be reduced in marijuana users due to the presence of one or more CBs because of their immune modulatory and anti-inflammatory properties. We assessed the association between DM and marijuana use among adults aged 20-59 years in a national sample of the general population(Devane *et al.*, 1992; Smit & Crespo, 2001; Carrier *et al.*,2005; Rodondi *et al.*,2006; Blazer & Wu,2009)

With the legalization of cannabis and related product, it is necessary to review some of the health consequences for people with regular intake of marijuan. Diabetes is becoming the most expensive disease in the U.S., costing over $100 billion for diagnosis and treatment per year since 2013 (Dieleman *et al.*,2016). As of 2014, centers for disease control and prevention (CDC) published statistic data of total diabetes patients in the U.S. to be around 29 million, over 80 million people have prediabetes. Recent advancement in portable personal electronic monitoring device helped with diagnosis of prediabetes (Cai *et al.*,2016). The total number of diabetes patients in the world was estimated to be around 285 million; the number is projected to be more than 438 million

by 2030 (Nolan *et al.*,2011) . Diabetes mellitus can be classified as type 1 and type 2. Type 1 diabetes arises from auto immune disorders led by destruction of insulin secretary pancreatic beta-cells (Nolan *et al.*,2011). From a geographical perspective, the prevalence of type 1 diabetes is higher in area with less sunlight such as Finland and lower in area with more sunlight, e.g. India. Furthermore, more cases of type 1 diabetes were diagnosed in winter where sunlight is minimal. This trend is similar to what was found for people with less vitamin D3 synthesis by their skin cells where exposure to sunlight radiation was at reduced amount and higher incidence of cancer, for example . From a genetic perspective, certain mutations or disruption of DNA nucleotide base pairs (Ko *et al.*,2010), for example, single-nucleotide polymorphism in the gene encoding lymphoid protein tyrosine phosphatase (an enzyme found to attenuate T-cell activation) (Bottini *et al.*,2004) are associated with type 1 diabetes. The cause of type 2 diabetes is complex and can be attributed to many factors such as high-energy diet and lack of exercise. Wang and coworkers (Wang *et al.*,2016) reported inhibition of tyrosine phosphatase enhances insulin sensitivity and could provide therapeutic potential for type 2 diabetes. Cruz and coworkers (Cruz *et al.*,2008)

reported glycine (amino acid normally exists in microhydrated zwitterionic form could increase insulin sensitivity and reduce level of glycated hemoglobin (Tian *et al.*,2009).

Amphetamines - damage and symptoms of amphetamine abuse

Amphetamines are a type of psychotropic stimulant, and their use triggers the centers of the central nervous system. Although previously used to treat many diseases, they showed high addictive properties, which led to a reduction in their medical use, and placed them on the list of controlled and banned drugs.

Currently used to treat diseases such as hyperactivity, attention deficit in children, incurable obesity, Parkinson's, depression, amphetamines are taken under medical supervision, and constant monitoring to avoid reaching the stage of addiction.

Some individuals use amphetamines for sexual stimulation, increased sexual directness, and peak euphoria.

Despite medical warnings against taking amphetamines, a study has shown that taking small doses of amphetamines can restore brain function in older people to normal and also improve memory. The most famous drugs that make up amphetamines are the main active substances such as captagon, ritalin, dexamamine and methamphetamine.

Forms and methods of taking amphetamines:

This substance is sold commercially in the form of tablets, capsules, powder or granules, and is taken orally by swallowing or sublingual status, smelling, injections or smoking.

Amphetamine sellers often mix powder with other things that look similar to them to make them most effective.

Some mix them with substances that have an undesirable or adverse effect, and it is difficult to know exactly what they contain.

I also recognize what is the best addiction treatment hospital and the cost of addiction treatment centers in Egypt.

History of amphetamine:

A drug made in Germany in 1880 and considered a safe drug of good medical value. However, its many use have proved to be at risk of getting used to.

Users experience euphoria, activity, loss of sleep, and a large energy for a few hours, after which they appear exhausted with frustration, inability to concentrate and a sense of harassment that can lead them to violence.

It was known in 1930 as a sniffing drug for the treatment of nasal congestion and colds. In 1937, amphetamine was produced as sleeping pills. The warriors of World War II were

They take it to overcome stress, where they remain vigilant.

In 1960, amphetamine was commonly used among truck drivers to remain vigilant in long distances. Amphetamine addiction leads to palpitations, dry mouth, thinner, inability to relax, then the pupil expands, the pulse accelerates and the pressure rises with the possibility of heart siege and nausea. Over-dose leads to membrane, defibrillation and a seizure that can lead to death, which is exciting for the nervous system.

Amphetamine damage:

Amphetamine damages and effects vary depending on the amount taken. Is it a little or big?

Small quantities:

The rapid effects of a normal dose of amphetamine (15mg) include inhibition of appetite for food, a marked increase in attention, self-confidence and euphoria, increased morale, reduced fatigue and anxiety.

Amphetamines also cause dilation of the pupils, high blood pressure, perspiration, increased heartbeat, and in some cases amphetamine intake leads to anxiety.

Amphetamines also cause dilation of the pupils, high blood pressure, perspiration, increased heartbeat, and in some cases amphetamine intake leads to anxiety.

After repeated use of the normal dose, the body is likely to have an effect so that it is significantly less effective, forcing the user to increase the amount of the dose, and the number of times taken, the amount of daily doses may in some cases amount to grams of amphetamine, and in others up to two or four grams per day.

Large quantities:

causes the use of

Visual and auditory hallucinations, tremors, insomnia, fear, restlessness, high blood pressure and body temperature, chest pain, headache, infectious disorders, muscle function disorders and chatter, as well as fatigue of forces due to lack of sleep and food.

Symptoms of amphetamine abuse:

headache

vortex

Insomnia and stress

Speed of breathing

Heartbeats are fast and irregular.

Pallor

Feeling too strong

Aggressiveness

Hallucinations.

Effects of amphetamine use:

The use of amphetamines through inhalation causes nosebleeds, sinus problems, and destruction of internal nasal components

Injectable use of amphetamines using used or unclean needles leads to viral hepatitis (C ORB) and/or AIDS. Blood poisoning is also the case, and the skin (injected) may develop cysts and pus.

The use of injectable amphetamines for a long period of time causes:

Blockage of blood vessels (caused by substances mixed with amphetamines) causing serious damage to some organs of the body such as liver, heart, etc.

Vasculitis and cysts.

Injecting amphetamines increases the risk of dependence. There are many health problems.

Signs of amphetamine users:

Frequent movement, speech and unconscious instability.

Anxiety, tension, a sense of psychological rebellion, persecution, impatience and skepticism of others, leading to riots and acts of violence for no reason.

Frequent itching of the nose for the dryness of the mucosa.

It smells bad from the mouth and the lips sometimes cracked and moisturizes the tongue.

The pupils of the eye are wide and affected by reflective lights.

Lack of inclination to food and digestive disorders.

A significant increase in sweat secretion.

The country - poor memory - difficulty thinking - instability.

Suicidal tendencies when stopping abuse.

Inability to sleep with fatigue and severe stress due to the presence of the stimulant in his body.

Treatment of amphetamine abuse and addiction:

The difficulty of treating amphetamine use lies in the ability to help the therapist continue to stop amphetamine abuse. Which is very effective and highly yearning.

Use of several methods in the patient's behavioral therapy such as: individual- family - group

Psychotherapy plays an important role by treating psychotic symptoms associated with amphetamines through the use of antipsychotic antipsychotics and continues for short periods until those symptoms are eliminated.

In the early days of quitting amphetamines, antipsychotics are required even in the absence of psychotic symptoms in the therapist and Diazepam benzodiazepine compounds such as Valium to control the over-motor activity of the therapist and prevent agitation.

The therapist should reach a consistent level of treatment with the patient to help him deal with depression and personality disorders or both because of severe difficulties facing behavioral therapy in the treatment of people who are heavily dependent on amphetamine compounds.

Chapter Three

Materials and Methods

3. Materials and Methods

3.1. Subjects

3.1.1. Patients group

This study was conducted in the College of Science/University of Babylon . A sixty middle-aged from (18-50) years male adults and elderly were enrolled in this case – control study, this study groups classified by the following forty diabetes patients and drug addicts and twenty normal healthy individuals no diabetes mellitus (control group).

All patients in the study were referred and diagnosed in the Al-Sadr Medical City in Najaf conducting from March 2021 to August 2021.

Inclusion criteria:

- Patient from age (18-50) years males divide seven groups by age who were referred as Diabetes patients and and drug addicts

Exclusion criteria:

- Patient had current infection diagnosed from history and examination with/or without investigation.
- Patient had immunocompromised (medication, disease).
- Patient with autoimmune disease.
- Patient with uremia.

3.1.2.Specimens collection:

Sixty human blood samples were collected from all subjects in this study, samples distribution was:

3.2. Materials

3.2.1. Instruments and Equipment

The following instruments and equipment were used in this study are listed in table (3-1).

Table (3-1): Equipment and their companies:

No.	Instruments	Company	Origin
1	Centrifuge	Eppendorf	Germany
2	Deep freezer	arcelik	Turkish
3	Water bath	Memmert	Germany
4	Micropipettes (1000,200,100,25,20 µl)	Eppendorf	Germany
5	Refrigerator	National	Japan
6	Gel tube	Plastilab	Lebanon
No.	**Instruments**	**Company**	**Origin**
7	Plain tube 10ml	Plastilab	Lebanon
8	Spectrophotometer	Apple	Japan
9	Autoclave	Lab Tech	Korea

3.2.2. Kits:

Table (3-2):Kits use in this study

No.	Name of Kit	Company	Origin
1	Glucose Enzyme Reagent	Linear	Spain

3.3.Methods

3.3.1.Sera samples preparation:

Blood samples were collected by drawing 3ml of blood from each subject included in this study using sterile 5ml syringes with sterile needle G-22 blood samples of diabetes mellitus patients only and healthy control were collected,both case blood and control blood collected in 10ml capacity sterile gel tubes and labeled with name, age, gender and date of their collection then serum was obtained. After blood clot formation at room temperature within 30 minutes or put tubes in water bath at 37 ºC for 10 minutes, clot blood sample were centrifuged at 2500 r.p.m. for 5 minutes. Separated sera samples were collected, distributed in 0.5 ml quantities in sterile containers, labeled and stored frozen at -20ºC until used.

3.3.2.Reagents for measurement of glucose

Reagent composition:

R1 Monoreagent:phosphate buffer 100 mmol/L PH 7.5,glucose oxidase >10 KU/L,4-aminoantipyrine 0.5 mmol/L,phenol 5 mmol/L.

CAL Glucose standard : Glucose 100 mg/dL (5.55 mmol/L).Organic matrix based primary standard.Concentration value is traceable to standard reference material 917b.

Procedure

1.Bring reagents and samples to room temperature.

2.Pipettes into labeled tubes:

Tubes	Blank	Sample	Cal Standared
R1.Monoreagent	1.0 mL	1.0 mL	1.0Ml
Sample	-	10µL	-
CAL Standared	-	-	10µL

3.Mix and let the tubes stand 10 minutes at room temperature.

4.Read the absorbance (A) of the samples and the standarad at 500 nm against the reagent blank.

The color is stable for about 2 hours protected from light.

3.3.3.Whole blood samples preparation:

Two ml of venous blood was collected by disposable syringe after cleaning the skin by cotton containing iodine, then blood which withdrawn put in gel tube container and then leave in at room temperature

Chapter four

Results and Discussion

4.Results and Discussion

4.1.1. Results

A total of 40 patients (illicit drug with diabetes mellitus) from different ages and 20 healthy individuals were the results**:**

Serum random blood sugar levels were measured for all participants in the group one and results are shown in table (4-1), figure (4-1). Median serum level of RBS in patients with DM and users of marijuana was **66.67** ± 18.32 pg/ml and user of amphetamine was 56.66±18.32, while that of control groups was **126.00** ± 28.16 pg/ml. Hence serum level of RBS was significantly higher in patients with DM than control group (P ≤ 0.001).

Table (4-1): Frequency distribution of patients and control subjects according to level of random blood sugar (group one), age from (18-21)years.

	subjects		
	Patients(No.6)	***Control(No.3)***	***P***
Random blood sugar(pg/ml)			
	Age 18-21 years		
Mean± SD	**66.67** ± 18.32	**126.00** ± 28.16	**< 0.001 † HS**
SE	**7.48**	**16.25**	
R.B.S(marijuana)	**66.66**	**126**	**0.0002**
R.B.S (amphetamine)	**56.66**	**106**	**0.0008**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

Serum random blood sugar levels were measured for all participants in the group two and results are shown in table (4-2), figure (4-2). Median serum level of RBS in patients with DM and users of marijuana was **68.50** ± 15.109 pg/ml and user of amphetamine was 66.32±15.109, while that of control groups was **100.67** ± 14.84 pg/ml. . Hence serum level of RBS was significantly in patients with DM than control group (P = 0.039).

Table (4-2): Frequency distribution of patients and control subjects according to level of random blood sugar (group two), age from (21-24)years.

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (21-24)years		
Mean± SD	**68.50** ± 15.109	**100.67** ± 14.84	**0.039 † S**
SE	**6.16**	**8.56**	
R.B.S(marijuana)	**68.50**	**100.66**	**0.022**
R.B.S (amphetamine)	**66.32**	**87.66**	**0.017**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

Serum random blood sugar levels were measured for all participants in the group three and results are shown in table (4-3), figure (4-3). Median serum level of RBS in patients with DM and users of marijuana was **89.33** ± 27.76 pg/m and user of amphetamine was 77.83±27.76, while that of control groups was **122.00** ± 12.12 pg/ml. . Hence serum level of RBS was no significantly in patients with DM than control group (P = 0.120).

Table (4-3): Frequency distribution of patients and control subjects according to level of random blood sugar (group three). age from (24-28)years

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (24-28)years		
Mean± SD	**89.33** ± 27.76	**122.00** ± 12.12	**0.120 † NS**
SE	**11.33**	**7.00**	
R.B.S(marijuana)	**89.33**	**122**	**0.089**
R.B.S (amphetamine)	**77.83**	**103**	**0.031**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

Serum random blood sugar levels were measured for all participants in the group four and results are shown in table (4-4), figure (4-4). Median serum level of RBS in patients with DM and users of marijuana was **102.50** ± 31.87 pg/ml and user of amphetamine was 98.44±31.87 , while that of control groups was **97.00** ± 11.35 pg/ml. . Hence serum level of RBS was no significant in patients with DM than control group (P = 0.786).

Table (4-4): Frequency distribution of patients and control subjects according to level of random blood sugar (group four). age from (28-32)years

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (28-32)years		
Mean± SD	**102.50** ± 31.87	**97.00** ± 11.35	**0.786† NS**
SE	**13.01**	**6.55**	
R.B.S(marijuana)	**102.50**	**97**	**0.541**
R.B.S (amphetamine)	**98.44**	**81.87**	**0.245**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

Serum random blood sugar levels were measured for all participants in the group five and results are shown in table (4-5), figure (4-5). Median serum level of RBS in patients with DM and users of marijuana was **99.00** ± 42.87 pg/ml and user of amphetamine was 84.67±42.87 , while that of control groups was **111.00** ± 18.52 pg/ml. . Hence serum level of RBS was no significant in patients with DM than control group (P = 0.665).

Table (4-5): Frequency distribution of patients and control subjects according to level of random blood sugar (group five). age from (32-36)years

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (36-42)years		
Mean± SD	**99.00** ± 42.87	**111.00** ± 18.52	**0.665† NS**
SE	**17.50**	**10.69**	
R.B.S(marijuana)	**99**	**111**	**0.452**
R.B.S (amphetamine)	**84.67**	**109**	**0.213**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

Serum random blood sugar levels were measured for all participants in the group six and results are shown in table (4-6), figure (4-6). Median serum level of RBS in patients with DM and users of marijuana was **87.33** ± 11.219 pg/ml , and user of amphetamine was 85.21±11. 219 while that of control groups was **126.66** ± 26.159 pg/ml. . Hence serum level of RBS was significant in patients with DM than control group (P =0.013).

Table (4-6): Frequency distribution of patients and control subjects according to level of random blood sugar (group six). age from (36-42)years

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (36-42)years		
Mean± SD	**87.33** ± 11.219	**126.66** ± 26.159	**0.013† S**
SE	**4.58**	**15.10**	
R.B.S(marijuana)	**87.33**	**126.66**	**0.009**
R.B.S (amphetamine)	**85.21**	**119.74**	**0.004**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001;

Serum random blood sugar levels were measured for all participants in the group seven and results are shown in table (4-7), figure (4-7). Median serum level of RBS in patients with DM and users of marijuana was **81.50**± 21.64 pg/ml and user of amphetamine was 79.65±21.64, while that of control groups was **99.33** ± 27.97 pg/ml. . Hence serum level of RBS was no significant in patients with DM than control group (P = 0.321).

Table (4-7): Frequency distribution of patients and control subjects according to level of random blood sugar (group seven). age from (42-50)years

	subjects		
	Patients No.6	***control No.3***	***P***
Random blood sugar (pg/ml)			
	Age (42-50)years		
Mean± SD	**81.50**± 21.64	**99.33** ± 27.97	**0.321† NS**
SE	**8.83**	**16.14**	
R.B.S(marijuana)	**81.50**	**99.33**	**0.293**
R.B.S (amphetamine)	**79.56**	**98.21**	**0.028**

SD: standard deviation; †: independent samples t-test; HS: Highly significant at P ≤ 0.001.

4.1.2. Discussion

In current study,the random blood sugar level in blood was measured for seven groups, and it was found that in all of them, the blood sugar level was lower for the drug users compared to the healthy people as in all tables and this agree with (Rajavashisth *et al.*,2012) we noted the lowest prevalence of DM in current light marijuana users, with current heavy marijuana users and past users also having a lower prevalence of DM than non-marijuana users. Thus, it is unlikely that a healthier diet contributed to the decreased prevalence of DM among marijuana users found in our study . We postulate that the decreased prevalence of DM and marijuana use may be due to the anti-inflammatory properties of marijuana**.** Hu and colleagues reported that CRP, but not interleukin-6 and tumour necrosis factor-a receptor-2, was associated with the risk of developing DM (Hu *et al.*,2004).

In another study (Cao *et al.*,2017) the results were later in 2013, Mittleman and coworkers (Penner *et al.*,2013) analyzed data from the National Health and Nutrition Examination Survey (NHANES) including 4657 adult men and women from 2005 and 2010. They reported that the correlation between marijuana use and lower fasting insulin level and less insulin resistant is statistically significant. The current marijuana users have lower insulin level (7.5 μU/mL) than non-users (10.1 μU/ml) on average while past users have insulin level between the two groups (8.8 μU/ml). Glucose level is also higher for the non-users (103.5 mg/dL) than current marijuana users (99.7 mg/dL) and for past users the level is (100.6 mg/dL).

Conclusions and recommendation

Conclusions:

1. In this work there was significantly higher in patients with DM than control group ($P \leq 0.001$).
2. Marijuana is classified as Cannabis saiva L, one type of hemp. For diabetes patients,THC (tetrahydrocannabinol) has been reported to have preventative or treatment effects.
3. Marijuana use was independently associated with a lower prevalence of DM.

Recommendations:

A study should be done on the effect of marijuana and amphetamine and its genetic and immunological effects

References

References:

Adams, D. E., Presley, L. A., Baumstark, A. L., Hensley, K. W., Hill, A. L., Anose, K. S. et al. (1991). DNA analysis by restriction fragment length polymorphisms of blood and other body fluid stain subjected to contamination and environmental insults. J. Forensic Sci. 36:1284-98.

Adu-Mireku, S. (2003). The prevalence of alcohol, cigarette, and marijuana use among Ghanaian senior secondary students in an urban setting. *Journal of Ethnicity in Substance Abuse*, *2*(1), 53-65.

Ali, B.A., Abdallah, S.T., Abdallah, A.M. and Hussein, M.M. (2013). The Frequency of Type 2 Diabetes Mellitus among Diabetic Children in El Minia Governorate, Egypt. Sultan Qaboos Univ. Med. J.; 13(3):399-403.

American Diabetes Association (2009). Diagnosis and classification of diabetes mellitus. Diabetes Care; 32(1):62-7.

American Diabetes Association (2012). Executive summary: standards of medical care in diabetes—2012. Diabetes care; 35(1):4-10.

American Diabetes Association (2014). Standards of Medical Care in Diabetes—2014. Diabetes Care; 37(1):14-80.

Andersen, C. J., Murphy, K. E., & Fernandez, M. L. (2016). Impact of obesity and metabolic syndrome on immunity. *Advances in Nutrition*, *7*(1), 66-75.

Asante, K. O. (2019). Cannabis and amphetamine use and its psychosocial correlates among school-going adolescents in Ghana. *Child and adolescent psychiatry and mental health*, *13*(1), 1-9.

Asante, K. O., & Kugbey, N. (2019). Alcohol use by school-going adolescents in Ghana: Prevalence and correlates. *Mental Health & Prevention*, *13*, 75-81.

Asante, K. O., Kugbey, N., Osafo, J., Quarshie, E. N. B., & Sarfo, J. O. (2017). The prevalence and correlates of suicidal behaviours (ideation, plan and attempt) among adolescents in senior high schools in Ghana. *SSM-population health*, *3*, 427-434.

Asiseh, F., Owusu, A., & Quaicoe, O. (2017). An analysis of family dynamics on high school adolescent risky behaviors in Ghana. *Journal of Child & Adolescent Substance Abuse*, *26*(5), 425-431.

Atlas, D. (2015). International diabetes federation. *IDF Diabetes Atlas, 7th edn. Brussels, Belgium: International Diabetes Federation*.

Baynest, H. W. (2015). Classification, Pathophysiology, Diagnosis and Management of Diabetes Mellitus. Journal of Diabetes and Metabolism; 6(5):1-9.

Blazer, D. G., & Wu, L. T. (2009). Nonprescription use of pain relievers by middle-aged and elderly community-living adults: National Survey on Drug Use and Health. *Journal of the American Geriatrics Society*, *57*(7), 1252-1257.

Bogdan, C. (2001). Nitric oxide and the immune response. *Nature immunology*, *2*(10), 907-916.

Bookchin, R.M. and Gallop, P.M. (1968). Structure of haemoglobin A1c: nature of the N-terminal beta chain blocking group. Biochem. Biophys. Res. Commun.; 32(1):86-93.

Bottini, N., Musumeci, L., Alonso, A., Rahmouni, S., Nika, K., Rostamkhani, M., ... & Mustelin, T. (2004). A functional variant of lymphoid tyrosine phosphatase is associated with type I diabetes. *Nature genetics*, *36*(4), 337-338.

Boutens, L. and Stienstra, R. (2016). Adipose tissue macrophages: going off track during obesity. Diabetologia.;59(5):879-94.

Boyle, J.P., Thompson, T.J., Gregg, E.W., Barker, L.E. and Williamson, D.F. (2010). Projection of the year 2050 burden of diabetes in the US adult population: dynamic modeling of incidence, mortality, and prediabetes prevalence. Popul. Health Metr.; 8:29.

Buckingham, L. (2019). *Molecular diagnostics: fundamentals, methods and clinical applications*. FA Davis.

Buckleton, J., Triggs, C. M., Walsh, S. J. (2005). Forensic DNA evidence interpretation. Boca Raton, London, New York, Washington.

Bunn, H.F., Haney, D.N., Gabbay, K.H. and Gallop, P.M. (1975). Further identification of the nature and linkage of the carbohydrate in haemoglobin A1c. Biochem. Biophys. Res. Commun.; 67(1):103-9.

Butler, J. M. (2006). Genetics and genomics of core STR loci used in human identity testing. J. Forensic Sci. 51:253-265.

Cai, W., Huang, L., & Wang, S. (2016). Class D power amplifier for medical application. *Informatics Engineering, an International Journal*, *4*(2), 09-15.

Cao, R. (2016). *Binuclear Ligand Copper Dioxygen/Nitric Oxide Adducts: Characterization and Reactivity* (Doctoral dissertation, Johns Hopkins University).

Cao, R., Elrod, L. T., Lehane, R. L., Kim, E., & Karlin, K. D. (2016). A Peroxynitrite Dicopper Complex: Formation via Cu–NO and Cu–O2 Intermediates and Reactivity via O–O Cleavage Chemistry. *Journal of the American Chemical Society*, *138*(49), 16148-16158.

Cao, R., Wang, J., Zhang, W., Huang, H., Qiao, Y., Dai, Y., ... & Lai, H. C. (2017). Is Marijuana Beneficial for Prevention and Treatment of Diabetes?. *Am. J. Biomed. Sci*, *9*(4), 200-210.

Carrier, E. J., Patel, S., & Hillard, C. J. (2005). Endocannabinoids in neuroimmunology and stress. *Current Drug Targets-CNS & Neurological Disorders*, *4*(6), 657-665.

Central Intelligence Agency (2008). The World Fact book.

Chen, L., Magliano, D.J. and Zimmet, P.Z. (2014). The worldwide epidemiology of type 2 diabetes mellitus--present and future perspectives. Nature reviews endocrinology; 8(4):228-36.

Cooper, J. D., Smyth, D. J., Walker, N. M., Stevens, H., Burren, O. S., Wallace, C., ... & Todd, J. A. (2011). Inherited variation in vitamin D genes is associated with predisposition to autoimmune disease type 1 diabetes. *Diabetes*, *60*(5), 1624-1631.

Cruz, M., Maldonado-Bernal, C., Mondragon-Gonzalez, R., Sanchez-Barrera, R., Wacher, N. H., Carvajal-Sandoval, G., & Kumate, J. (2008). Glycine treatment decreases proinflammatory cytokines and increases interferon-γ in patients with Type 2 diabetes. *Journal of endocrinological investigation*, *31*(8), 694-699.

Deshpande, A. D., Harris-Hayes, M., & Schootman, M. (2008). Epidemiology of diabetes and diabetes-related complications. *Physical therapy*, *88*(11), 1254-1264.

Deshpande, et.al(2008) C.D.C,2011.

Devane, W. A., Hanus, L., Breuer, A., Pertwee, R. G., Stevenson, L. A., Griffin, G., ... & Mechoulam, R. (1992). Isolation and structure of a brain constituent that binds to the cannabinoid receptor. *Science*, *258*(5090), 1946-1949.

Di Marco, E., Gray, S.P. and Jandeleit-Dahm, K. (2013). Diabetes alters activation and repression of pro- and anti-inflammatory signaling pathways in the vasculature. Front. Endocrinol.; 4:68.

Diabetes Mellitus Interagency Coordinating Committee (2014). Genetic basis of type 1 and type2 diabetes, obesity, and their complications. Advances and emerging opportunities in diabetes research: a Strategic Planning report of the DMICC.

Dieleman, J. L., Baral, R., Birger, M., Bui, A. L., Bulchis, A., Chapin, A., ... & Murray, C. J. (2016). US spending on personal health care and public health, 1996-2013. *Jama*, *316*(24), 2627-2646.

DiGangi, C. (2016). Neutrophil-lymphocyte ratio: Predicting cardiovascular and renal complications in patients with diabetes. J. Am. Assoc. Nurse Pract.; 28(8):410-4.

Doku, D. (2012). Substance use and risky sexual behaviours among sexually experienced Ghanaian youth. *BMC public health*, *12*(1), 1-7.

Eizirik, D. L., Colli, M. L., & Ortis, F. (2009). The role of inflammation in insulitis and β-cell loss in type 1 diabetes. *Nature Reviews Endocrinology*, *5*(4), 219-226.

English, E., Milosovich, E.T. and John, W.G. (2014). In vitro determination of hemoglobin A1c for diabetes diagnosis and management: technology update. Pathology and Laboratory Medicine International; 6: 21-31.

Ezegbogu, M.O. and Abdulsalam, K. (2018). Glycated haemoglobin (HBA1C): an update on available methods. Bayero Journal of Pure and Applied Sciences; 11(1):8-14.

Farrell, M., & Marshall, E. J. (2006). Epidemiology of tobacco, alcohol and drug use. *Psychiatry*, *5*(12), 427-430.

Fortunato, F., Cappelli, M.G., Vece, M.M., Caputi, G., Delvecchio, M., Prato, R. and Martinelli, D. (2016). Incidence of type 1 diabetes among children and adolescents in Italy between 2009 and 2013: the role of a regional childhood diabetes registry. J. Diabetes. Res.; 2016(2016):1-7.

Frostegard, J. (2013). Immune mechanisms in atherosclerosis, especially in diabetes type 2. Front. Endocrinol.; 4:162.

Gaaib, J. N., Nassief, A. F., & Al-Assi, A. (2011). Simple salting-out method for genomic DNA extraction from whole blood. *Tikrit J Pure Sci*, *16*(2), 1813-662.

Gill, P., Jeffreys, A. J., & Werrett, D. J. (1985). Forensic application of DNA 'fingerprints'. *Nature*, *318*(6046), 577-579.

Gillett, M.J. (2009). International Expert Committee Report on the Role of the A1C Assay in the Diagnosis of Diabetes. Diabetes Care; 32(7): 1327-34. (Gillett, 2009)

Goldberg, R. B. (2009). Cytokine and cytokine-like inflammation markers, endothelial dysfunction, and imbalanced coagulation in development of diabetes and its complications. The Journal of Clinical Endocrinology & Metabolism; 94(9): 3171-82

Goldberg, R. B. (2009). Cytokine and cytokine-like inflammation markers, endothelial dysfunction, and imbalanced coagulation in development of diabetes and its complications. The Journal of Clinical Endocrinology & Metabolism; 94(9): 3171-82

Goldberg-Looney, L. D., Sánchez-SanSegundo, M., Ferrer-Cascales, R., Albaladejo-Blazquez, N., & Perrin, P. B. (2016). Adolescent alcohol use in Spain: connections with friends, school, and other delinquent behaviors. *Frontiers in psychology*, *7*, 269.

Gore, F. M., Bloem, P. J., Patton, G. C., Ferguson, J., Joseph, V., Coffey, C., ... & Mathers, C. D. (2011). Global burden of disease in young people aged 10–24 years: a systematic analysis. *The Lancet*, *377*(9783), 2093-2102.

Gray, K. M. (2007). Marijuana use, withdrawal, and craving in adolescents. *Psychiatric Times*, *24*(13), 57-57.

Guarner V., Rubio-Ruiz M. E. (2014) Low-grade systemic inflammation connects aging, metabolic syndrome and cardiovascular disease. Aging and Health—A Systems Biology Perspective.;40:99-106. doi: 10.1159/000364934.

Guzmán-Flores, J.M.and López-Briones, S. (2012). Cells of innate and adaptive immunity in type 2 diabetes and obesity. Gac. Med. Mex.; 148(4):381-9.

Hall, W., & Degenhardt, L. (2009). Adverse health effects of non-medical cannabis use. *The Lancet*, *374*(9698), 1383-1391.

Hodgson K, Morris J, Bridson T, Govan B, Rush C, Ketheesan N. (2015) Immunological mechanisms contributing to the double burden of diabetes and intracellular bacterial infections. Immunology; 144(2):171-85.

Holman, N., Young, B. and Gadsby, R. (2015). Current prevalence of type 1 and type 2 diabetes in adults and children in the UK. Diabet. Med. 32(9):1119-20.

Hotamisligil G. S., Shargill N. S., Spiegelman B. M. (1993) Adipose expression of tumor necrosis factor-α: direct role in obesity-linked insulin resistance. Science.;259(5091):87-91.

Houstis, N., Rosen, E. D., & Lander, E. S. (2006). Reactive oxygen species have a causal role in multiple forms of insulin resistance. *Nature*, *440*(7086), 944-948.

Hu, F. B., Meigs, J. B., Li, T. Y., Rifai, N., & Manson, J. E. (2004). Inflammatory markers and risk of developing type 2 diabetes in women. *Diabetes*, *53*(3), 693-700.

Hue, N. T., Chan, N. D. H., Phong, P. T., Lingh, N. T. T. and Giang, N. D. T. (2012). Extraction of human genomic DNA from dried blood spots and hair roots. Int. J. Biosci., Biochem. And Bioinf., Vol. 2, No. 1.

Huisman TH, Martis EA, Dozy A. (1958) Chromatography of hemoglobin types on carboxymethylcellulose. JLab Clin Med.;52:312-27.

Inoguchi, T., Li, P., Umeda, F., Yu, H. Y., Kakimoto, M., Imamura, M., ... & Nawata, H. (2000). High glucose level and free fatty acid stimulate reactive oxygen species production through protein kinase C--dependent activation of NAD (P) H oxidase in cultured vascular cells. *Diabetes*, *49*(11), 1939-1945.

International Diabetes Federation (2015). IDF Diabetes Atlas, 7th ed.; IDF: Brussels, Belgium.

International Diabetes Federation (2017a). IDF Diabetes Atlas -8th Edition, Brussels, Belgium.

International Diabetes Federation (2017b). IDF MENA Members Atlas - 8th Edition.

Janeway, C. A., & Medzhitov, R. (2002). Innate immune recognition. Annu Rev Immunol.

Javadi, A., Shamaei, M., Ziazi, L. M., Pourabdollah, M., Dorudinia, A., Seyedmehdi, S. M., & Karimi, S. (2014). Qualification study of two genomic DNA extraction methods in different clinical samples. *Tanaffos*, *13*(4), 41.

Jeffreys, A. J., Brookfield, J. F., & Semeonoff, R. (1985a). Positive identification of an immigration test-case using human DNA fingerprints. *Nature*, *317*(6040), 818-819. Jeffreys, A. J., Brookfield, J. F., & Semeonoff, R. (1985). Positive identification of an immigration test-case using human DNA fingerprints. *Nature*, *317*(6040), 818-819.

Jeffreys, A. J., Wilson, V. and Thein, S. L. (1985b). Individual-specific „fingerprints" of human DNA. Nature 316:76-79.

Julian, R., Kelty, S., & Robertson, J. (2012). "Get it right the first time": Critical Issues at the Crime Scene. *Current issues in criminal justice*, *24*(1), 25-37.

Karaa, A., & Goldstein, A. (2015). The spectrum of clinical presentation, diagnosis, and management of mitochondrial forms of diabetes. *Pediatric diabetes*, *16*(1), 1-9.

Karlin, K. D., Sharma, S. K., & Cao, R. (2014, August). Peroxynitrite (O= NOO-) generation at metal complex centers via (ligand)-M/NO/O-2 reactivity. In *ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY* (Vol. 248). 1155 16TH ST, NW, WASHINGTON, DC 20036 USA: AMER CHEMICAL SOC.

Kasem, S., Rice, N., & Henry, R. J. (2008). 14 DNA Extraction from Plant Tissue. *Plant genotyping II: SNP technology*, 219.

Kessler, H. H., Mühlbauer, G., Stelzl, E., Daghofer, E., Santner, B. I., & Marth, E. (2001). Fully automated nucleic acid extraction: MagNA Pure LC. *Clinical Chemistry*, *47*(6), 1124-1126.

Khan HA, Ola MS, Alhomida AS, Sobki SH, Khan SA. (2014) Evaluation of HbA1c criteria for diagnosis of diabetes mellitus: a retrospective study of 12785 type 2 Saudi male patients. Endocr Res.;39:62-6.

Khan MI, Weinstock RS. (2011) Chapter 16: Carbohydrates. In: McPherson RA, Pincus MR, eds. Henry's Clinical Diagnosis and Management by Laboratory Methods. 22nd ed. Philadelphia, PA: Saunders Elsevier;:210-25.

Kitabchi, A.E., Umpierrez, G.E., Miles, J.M. and Fisher, J.N. (2009). Hyperglycemic crises in adult patients with diabetes. Diabetes Care; 32(7): 1335-43.

Ko, Y. J., Wang, H., Cao, R., Radisic, D., Eustis, S. N., Stokes, S. T., ... & Bowen, K. H. (2010). Photoelectron spectroscopy of homogeneous nucleic acid base dimer anions. *Physical Chemistry Chemical Physics*, *12*(14), 3535-3541.

Koenig RJ, Peterson CM, Jones RL, Saudek C, Lehrman M, Cerami A. (1976) Correlation of glucose regulation and hemoglobin AIc in diabetes mellitus. N Engl J Med.;295:417-20.

Kpozehouen, A., Ahanhanzo, Y. G., Paraïso, M. N., Munezero, F., Saizonou, J. Z., Makoutodé, M., & Ouédraogo, L. T. (2015). Factors associated with psychoactive substance use among Beninese adolescents. *Sante Publique*, *27*(6), 871-880.

Kugbey, N., Ayanore, M. A., Amu, H., Asante, K. O., & Adam, A. (2018). International note: Analysis of risk and protective factors for risky sexual behaviours among school-aged adolescents. *Journal of adolescence*, *68*, 66-69.

Kumar PJ. and Clark KM. (2005) Diabetes Mellitus and other disorder of metabolism . Kumar &Clark Clinical Medicine; pp. 1101 -1130.

Landsteiner, K. (1900). Zur Kenntnis der antifermentativen, lytisichen und agglutinierenden Wirkungen des Blutserums und der Lymphe. Zentralbl. Bakteriol. 27:357-362.

Lee, H. C. and Ladd, C. (2001). Preservation and Collection of Biological Evidence. Croat Med. J. 42:225-228.

Lee, H. C., Ladd, C., Bourke, M. T., Pagliaro, E. and Tirnady, F. (1994). DNA typing in forensic science. Am. J. Forensic Med. Pathol. 15:269-82.

Lou, M., Luo, P., Tang, R., Peng, Y., Yu, S., Huang, W. and He, L. (2015). Relationship between neutrophil-lymphocyte ratio and insulin resistance in newly diagnosed type 2 diabetes mellitus patients. B. M. C. Endo. Disord.; 15:9.

M Carpi, F., Di Pietro, F., Vincenzetti, S., Mignini, F., & Napolioni, V. (2011). Human DNA extraction methods: patents and applications. *Recent Patents on DNA & Gene Sequences (Discontinued)*, *5*(1), 1-7.

Malentacchi , F . ,Ciniselli ,C.M. , Pazzagli,M.,Verderio, P., Barraud , L. Hartmann , C. C. et al.(2015). Influence of pre- analytical procedures on genomic DNA

integrity in blood samples : The SPIDIA experience, Clinica chimica Acta . 440,205-210.

Mathis D. (2013)Immunological goings-on in visceral adipose tissue. Cell Metabolism.;17(6):851-859.

Maurya, R., Kumar, B., & Sundar, S. (2013). Evaluation of salt-out method for the isolation of DNA from whole blood: a pathological approach of DNA based diagnosis. *Int J Life Sci Biotechnol Pharma Res*, *2*(2), 53-57.

Ministry of Health of Brazil (2010). Secretaria de Vigilância em Saúde. Secretaria de Atenção à Saúde. Política nacional de promoção da saúde.

Moursy, E.Y., Megallaa, M. H., Mouftah, R. F. and Ahmed, S. M. (2015). Relationship between neutrophil lymphocyte ratio and microvascular complications in Egyptian patients with type 2 diabetes. Am. J. Intern. Med.; 3(6):250-5.

Narayan, K. V., Boyle, J. P., Geiss, L. S., Saaddine, J. B., & Thompson, T. J. (2006). Impact of recent increase in incidence on future diabetes burden: US, 2005–2050. *Diabetes care*, *29*(9), 2114-2116.

Nash, S. G., McQueen, A., & Bray, J. H. (2005). Pathways to adolescent alcohol use: Family environment, peer influence, and parental expectations. *Journal of adolescent health*, *37*(1), 19-28.

Nasiri, H., Forouzandeh, M., Rasaee, M. J., & Rahbarizadeh, F. (2005). Modified salting-out method: high-yield, high-quality genomic DNA extraction from whole blood using laundry detergent. *Journal of clinical laboratory analysis*, *19*(6), 229-232.

Newton, C. A., & Raskin, P. (2004). Diabetic ketoacidosis in type 1 and type 2 diabetes mellitus: clinical and biochemical differences. *Archives of internal medicine*, *164*(17), 1925-1931.

Nguyen DV, ShawLC, Grant MB (2012). Inflammation in the pathogenesis of microvas-cular complications in diabetes. Front. Endocrinol.; 3:170.

Nolan, C. J., Damm, P., & Prentki, M. (2011). Type 2 diabetes across generations: from pathophysiology to prevention and management. *The Lancet*, *378*(9786), 169-181.

Odegaard J. I., Ricardo-Gonzalez R. R., Goforth M. H., et al. (2007) Macrophage-specific PPARγ controls alternative activation and improves insulin resistance. Nature.;447(7148):1116-1120.

Ohene, S. A., Johnson, K., Atunah-Jay, S., Owusu, A., & Borowsky, I. W. (2015). Sexual and physical violence victimization among senior high school students in Ghana: Risk and protective factors. *Social Science & Medicine*, *146*, 266-275.

Olokoba, A. B., Obateru, O. A., & Olokoba, L. B. (2012). Type 2 diabetes mellitus: a review of current trends. *Oman medical journal*, *27*(4), 269.

Ouchi N., Parker J. L., Lugus J. J., Walsh K. (2011) Adipokines in inflammation and metabolic disease. Nature Reviews Immunology.;11(2):85-97.

Owusu, A. (2008). Ghana Country report on the global school-based health survey (GSHS). *Center for Disease Control and Prevention (CDC): Atlanta, CA*.

Peltzer, K., & Pengpid, S. (2018). Cannabis and amphetamine use and associated factors among school-going adolescents in nine African countries. *Journal of Child & Adolescent Substance Abuse*, *27*(2), 112-118.

Peltzer, K., Pengpid, S., & Tepirou, C. (2016). Associations of alcohol use with mental health and alcohol exposure among school-going students in Cambodia. *Nagoya journal of medical science*, *78*(4), 415.

Penner, E. A., Buettner, H., & Mittleman, M. A. (2013). The impact of marijuana use on glucose, insulin, and insulin resistance among US adults. *The American journal of medicine*, *126*(7), 583-589.

Pluddemann A, Price CP, Thompson M, Wolstenholme J, Heneghan C (2011) Primary care diagnostic technology update: point-of-care testing for glycosylated haemoglobin. Br J Gen Pract 61(583): 139-140.

Quist, D. A., Diaz, D. E., Liu, J. J., & Karlin, K. D. (2017). Activation of dioxygen by copper metalloproteins and insights from model complexes. *JBIC Journal of Biological Inorganic Chemistry*, *22*(2), 253-288.

Rahbar S, Blumenfeld O, Ranney HM. (1969) Studies of an unusual hemoglobin in patients with diabetes mellitus. Biochem Biophys Res Commun.;36:838-43

Rajavashisth, T. B., Shaheen, M., Norris, K. C., Pan, D., Sinha, S. K., Ortega, J., & Friedman, T. C. (2012). Decreased prevalence of diabetes in marijuana users: cross-sectional data from the National Health and Nutrition Examination Survey (NHANES) III. *BMJ open*, *2*(1), e000494.

Ramachandran, A. (2014). Know the signs and symptoms of diabetes. Indian J. Med. Res.; 140(5):579-81.

Richardson, V. R., K. A. Smith, and A. M. Carter, (2013). "Adipose tissue inflammation: feeding the development of type 2 diabetes mellitus,"Immunobiology, vol. 218, no. 12, pp. 1497-1504,.

Rodondi, N., Pletcher, M. J., Liu, K., Hulley, S. B., & Sidney, S. (2006). Marijuana use, diet, body mass index, and cardiovascular risk factors (from the CARDIA study). *The American journal of cardiology*, *98*(4), 478-484.

Ruiz-Miyazawa KW, Pinho-Ribeiro FA, Zarpelon AC, Staurengo-Ferrari L, Silva RL, Alves-Filho JC, et al. (2015). Vinpocetine reduces lipopolysaccharide-induced inflammatory pain and neutrophil recruitment in mice by targeting oxidative stress, cytokines and NF-kB. Chem Biol Interact; 237:9-17.

Ryden, L., Standhl, E., Bartnik, M., Berghe, G.V.D. and Betteridge, J. (2007). Guidelines on diabetes, pre-diabetes, and cardiovascular disease. Eur. Heart J.; 28(1):88-136. (Ryden et al., 2007).

Ryden.et. al ,(2015).

Saleh, M. A. (2011). Study complement activity and humoral immune response in type 2 diabetes mellitus. Diyala Agricultural Sciences Journal; 3(1): 34-46.

Sambrook, J., & Russell, D. W. (2006). Transcriptional run-on assays. *Cold Spring Harbor Protocols*, *2006*(1), pdb-prot3956.

Samreen, R. (2009). Diabetes mellitus. Scientific Research and Essay; 4(5):367-73.

Savage, J. E., Kaprio, J., Korhonen, T., Pulkkinen, L., Rose, R. J., Verhulst, B., & Dick, D. M. (2016). The effects of social anxiety on alcohol and cigarette use across adolescence: Results from a longitudinal twin study in Finland. *Psychology of Addictive Behaviors*, *30*(4), 462.

Schellenberg, E. S., Dryden, D. M., Vandermeer, B., Ha, C. & Korownyk,C. (2013). Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. Ann. Intern. Med. 159, 543-51.

Scott, A., Chambers, D., Goyder, E., & O'Cathain, A. (2017). Socioeconomic inequalities in mortality, morbidity and diabetes management for adults with type 1 diabetes: a systematic review. *PLoS One*, *12*(5), e0177210.

Seton, C. (1988). Life for sex killer who sent decoy to take genetic test. The Times, London.

Shisana, O., Rehle, T., Simbayi, L. C., Zuma, K., Jooste, S., Zungu, N., ... & Onoya, D. (2014). South African national HIV prevalence, incidence and behaviour survey, 2012.

Shu, C. J., Benoist, C. and Mathis, D. (2012). The immune system's involvement in obesity-driven type 2 diabetes. Seminars in Immunology.;24(6):436-42.

Siziya, S., Muula, A. S., Besa, C., Babaniyi, O., Songolo, P., Kankiza, N., & Rudatsikira, E. (2013). Cannabis use and its socio-demographic correlates among in-school adolescents in Zambia. *Italian journal of pediatrics*, *39*(1), 1-5.

Smit, E., & Crespo, C. J. (2001). Dietary intake and nutritional status of US adult marijuana users: results from the Third National Health and Nutrition Examination Survey. *Public health nutrition*, *4*(3), 781-786.

Srivastava, P., Srivastava S and Srivastava R. (2018). HbA1c-Glycated Hemoglobin: Perfect Tool to Curb the Diabetes. J. Endocrinol.; 2(2):1-3.

Suguna, S. A. J. J. A., Nandal, D. H., Kamble, S. U. R. E. S. H., Bharatha, A. M. B. A. D. A. S. U., & Kunkulol, R. A. H. U. L. (2014). Genomic DNA isolation from human whole blood samples by non enzymatic salting out method. *Int J pharm pharm sci*, *6*(6), 198-9.

Suguna, S., Nandal, D. H., Kamble, S., Bharatha, A. and Kunkulol, R. (2014). Genomic DNA Isolation from Human Whole Blood Sample by Non Enzamatic Salting out Method. Int. J. Pharma. and Pharmaceu. Sci. Vol. 6.

Tan, S. C., & Yiap, B. C. (2009). DNA, RNA, and protein extraction: the past and the present. *Journal of Biomedicine and Biotechnology*, *2009*.

Temneanu, O.R., Trandafir, L.M. and Purcarea, M.R. (2016). Type 2 diabetes mellitus in children and adolescents: a relatively new clinical problem within pediatric practice. J. Med. Life.; 9(3): 235-9.

Tian, S. X., Sun, X., Cao, R., & Yang, J. (2009). Thermal stabilities of the microhydrated zwitterionic glycine: A kinetics and dynamics study. *The Journal of Physical Chemistry A*, *113*(2), 480-483.

Turner, C. E. (1985). Marijuana and cannabis: research why the conflict. In *Marihuana'84: proceedings of the Oxford Symposium on Cannabis: 9th International Congress of Pharmacology, 3rd Satellite Symposium on*

Cannabis/edited by DJ Harvey; assistant editors Sir William Paton, GG Nahas. Oxford: IRL Press, c1985.

United Nation Office on Drugs and Crime. World Drug Report. New York, NY: United Nations; 2007.

United Nations Office on Drugs, & Crime. (2010). *World drug report 2010*. United Nations Publications.

Van Oorschot, R. A., Gutowski, S. J., Robinson, S. L., Hedley, K. W., Andrews, I. R., HUMTHO1validation studies. (1996). Effects of substrate, environment and mixtures. J. Forensic Sci. 41:142- 5.

Wang, J., Keceli, G., Cao, R., Su, J., & Mi, Z. (2017). Molybdenum-containing nitrite reductases: Spectroscopic characterization and redox mechanism. *Redox Report*, *22*(1), 17-25.

Wang, J., Zhang, W., Cao, R., You, X., & Lai, H. (2016) a . Analysis of nitrogen dioxide in environment. *Advances in Bioscience and Biotechnology*, *7*(06), 278.

Wang, M., Li, X., Dong, L., Chen, X., Xu, W., & Wang, R. (2016) b . Virtual screening, optimization, and identification of a novel specific PTP-MEG2 Inhibitor with potential therapy for T2DM. *Oncotarget*, *7*(32), 50828.

Weiss, L., Zeira, M., Reich, S., Har-Noy, M., Mechoulam, R., Slavin, S., & Gallily, R. (2006). Cannabidiol lowers incidence of diabetes in non-obese diabetic mice. *Autoimmunity*, *39*(2), 143-151.

WHO. World Health Organization: Diabetes; 2018.

World Health Organization - WHO (2013).

World Health Organization (2011). Use of Glycated Haemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus. Abbreviated Report of a WHO Consultation. Geneva: WHO.

World Health Organization (2012). World Health Statístcs 2012. Geneva: World Health Organization.

World Health Organization (2016). Global report on Diabetes Geneva: World Health Organization.

Xu, G., Liu, B., Sun, Y., Du, Y., Snetselaar, L. G., Hu, F. B., & Bao, W. (2018). Prevalence of diagnosed type 1 and type 2 diabetes among US adults in 2016 and 2017: population based study. *Bmj*, *362*.

You, W.P. and Henneberg, M. (2016). Type 1 diabetes prevalence increasing globally and regionally: the role of natural selection and life expectancy at birth. B.M.J. Open Diabetes Res. Care; 4(1):1-7.

Yusoff, F., Sahril, N., Rasidi, N. M., Zaki, N. A. M., Muhamad, N., & Ahmad, N. (2014). Illicit drug use among school-going adolescents in Malaysia. *Asia Pacific Journal of Public Health*, *26*(5_suppl), 100S-107S.

Zhao, T., Wang, H., Yu, C., Wang, J., Cui, Y., Zheng, X., ... & Meng, J. (2016). Classification and differentiation between kidney yang and yin deficiency syndromes in TCM based on decision tree analysis method. *International Journal of Clinical & Experimental Medicine*, *9*(11), 60017-9.

Zimmerman, S., & Zimmerman, A. M. (1990). Genetic effects of marijuana. *International journal of the addictions*, *25*(sup1), 19-33.

Zimmet, P.Z. (2017). Diabetes and its drivers: the largest epidemic in human history?. Clin. Diabetes Endocrinol.; 3:1.

الخلاصة:

اجريت هذه الدراسة على(40) فرد من مدمنين الماريجوانا THC وا لامفيتامين AMP و (20) عينة كمجموعة سيطرة للكشف عن تـأثير الماريجوانا على مرضى السكري.

جمعت عينات الدم من ستين شخصا من مدينة الصدر الطبية في النجف الاشرف . تم استخدام هذه العينات لقياس سكر الدم العشوائي 40 عينة دم من مرضى (مدمني مخدرات مصابين بمرض السكري) و20 فردا سليما تم تضمينهم كمجموعة مقارنة. هدفت هذه الدراسة الى تحديد تاثير تعاطي الماريجوانا والامفيتامين على مرض السكري على مدمني المخدرات .ومن خلال هذه الدراسة تم تقيم الارتباط بين مستوى السكر في الدم وتأثير المخدرات من خلال التحليل الاحصائي

قد تم تقسيمهم الى سبع مجاميع حسب العمر واظهر مستوى السكر العشوائي في الدم لبعض المجموعات السبع نسبة منخفضة لمتعاطي المخدرات بالمقارنة مع مستوى السكر في مصل الاشخاص الاصحاء في المجموعة الاولى ظهر فرق كبير في مستوى السكر بين المتعاطين والاصحاء حيث كانت الاحتمالية (<0.001) وفي المجموعة الثانية ظهر فرق كبير في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (=0.039)وفي المجموعة الثالثة لم يظهر فرق ملموس في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (=0.120) , وفي المجموعة الرابعة لم يظهر فرق ملموس في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (=0.786), وفي المجموعة الخامسة لم يظهر فرق ملموس في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (=0.665) , وفي المجموعة السادسة ظهر فرق في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (0.013) , وفي المجموعة السابعة لم يظهر فرق ملموس في مستوى السكر بين المجموعتين حيث كانت الاحتمالية (=0.321)

وزارة التعليم العالي والبحث العلمي

جـــــــامعة بابـــــــل

كـــــــلية العلوم

قسم علوم الحياة

العلاقة بين مدمني المخدرات من نوع الماريجوانا والامفيتامين مع مرض السكري

بحث

مقدم الى كلية العلوم/جامعة بابل

وهي جزء متطلبات نيل شهادة الدبلوم العالي في العلوم / الادلة الجنائية

من قبل

هند فاضل حسين علي

بكالوريوس علوم حياة

جامعة بغداد 2003م

إشراف

الاستاذ الدكتورة

ازهار حمزة حسن كاظم

2021م **1443هـ**