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(The relationship between diabetics and blood groups)

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بسم الله الرحمن الرحيم

(وَيَرَى الَّذِينَ أُوتُوا الْعِلْمَ الَّذِي أُنْزِلَ
إِلَيْكَ مِنْ رَبِّكَ هُوَ الْحَقَّ وَيَهْدِي إِلَى
صِرَاطِ الْعَزِيزِ الْحَمِيدِ)

صدق الله العلي العظيم

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الشكر والتقدير

احمد الله واشكره تعالى على ما انعم به علي من فضل وتوفيق فمنحني العلم والمعرفة والقدرة على إتمام الجهد المتواضع

ويسرني ان أتقدم بجزيل الشكر والتقدير

لا أستاذتي العزيزة

م . م نورس بهاء

والذي تفضلت مشكورة بقبول الاشراف على هذا البحث حيث قدمت لنا النصح والإرشاد طيلة فترة اعداده

والشكر الموصول الى عمادة كلية الحلة الجامعة وقسم الفيزياء الطبية الذين ساهمو من اجل انجاز هذا البحث بجودة وكفاءة

الإهداء

الى خالق الروح و القلم و بارئ الذر و النسم و خالق كل شي من العدم الى من خلق الرسالة و أدى الأمانة .. و نصح الامة .. الى نبي الرحمة و نور العالمين

الى الساده الاطهار وعروته الوثقى ..اهل بيت النبوة .

الى مراد قلبي و الأقرب لي من نفسي المغيب عن الابصار و الكامن بعين البصيرة الى بقيه الله الأعظم ....صاحب العصر و الزمان (عجل الله تعالى له الفرج) .

الى من علمني ان الدنيا كفاح ..و سلاحها العلم و المعرفة الى من سعه لأجل راحتي و نجاحي الى اعظم و اعز رجل في الكون ...(أبي العزيز) أطال الله في عمره .

الى من وضعتني على طريق الحياة الى من اوصاني الرحمن بها برا و أحسانا الى من كان دعائها سر نجاحي ..(امي الحبيبة) طيب الله ثراها.

الى الذين كبرت بينهم وأسير على الدرب معهم ..الى من يفرحون لنجاحي و كأنه نجاحهم ..(اشقائي وشقيقاتي)

الى كل من كان لنا عوناً في رحلة البحث

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Abstract

A number of samples (97) were taken from people of different sexes (male, female) and different ages, ranging from (7-80), When measuring blood sugar, Diabetes affects all ages, from 7 to 80 years. Type 1 diabetes may begin at any age, while type 2 is the most common and affects people over the age of 40. The type most affected by diabetes (O+) and the male gender is more susceptible to the disease.

The highest blood sugar level was 600 for a 30-year-old The lowest percentage is 91 for a 27-year-old The type most affected by diabetes (O+) appeared,The blood group least affected by diabetes is (AB)

In this work, diabetes is explained and defined as a metabolic disease that causes increased blood sugar level called hyperglycemia. Pathophysiology of DM, it can be classified into two common types type1,type2 the relationship between it and blood types is explained The “ABO” system consists of 4 major “ABO” phenotypes “A”, “B”, “O”, and “AB”. Phenotypic ABO blood categories are polymorphic, inherited, antigenic chemicals found on the top of red blood cells in addition to cells of other tissues,

The blood class of a person identified by small carbohydrate epitopes is determined by the occurrence or absence of genes “A” and “B”. The gene is put on chromosome 9q34 and contains 7 exons distributed pass on disperse over 18 kb called “ABO” blood classes.

The relationship between diabetics and blood groups

1.Introduction

Diabetes mellitus (DM) is a common metabolic disorder characterized by increased levels of glucose in blood due to defective production of insulin, Many studies were conducted to discover a possible association between ABO groups and DM and reported that there is a strong relation between DM and ABO blood groups[1]. Blood group or blood type is a type of proteins and sugars that are found on the surface of red blood cells and give the blood its type, There are multiple blood testing systems, but there are two basic systems : the blood group system, which is symbolized by the abbreviation ABO, and the rhesus system, which is symbolized by Rh[2].

1.1 Diabetes

Diabetes is a metabolic disease that causes increased blood sugar level called hyperglycemia, Pathophysiology of DM, it can be classified into two common types, In type-I Diabetes Mellitus (TIDM) there is unavailability of insulin hormone in the patient's blood., insulin hormone is not available in the blood of type-I diabetic patients, to overcome this deficiency, insulin injection is necessary for the patient affected with T1DM, Therefore, T1DM was previously called Insulin Dependent Diabetes Mellitus (IDDM)[3].

In addition rather a new term Latent Autoimmune Diabetes of Adult (LADA) is a condition in which T1DM develops in adults are frequently initially undiagnosed as having T2DM, based on age rather than cause, In Type-2 DM, pancreatic β-cells are capable to secrete enough amount of insulin hormone, but there is a defect at the receptor site, that hinders or resists in its function or physiology[4].

In spite of presence of sufficient amount of insulin hormone in the blood, it is not working properly and cannot help blood glucose to enter into the cell or tissue, As a result, blood glucose level rises called hyperglycemia due to this insulin receptor blockage or resistance, T2DM ranges from relative deficiency of insulin secretion to insulin resistance, As Patient does not need insulin injection in T2DM; hence this type of DM was previously called as Non-Insulin Dependent Diabetes Mellitus (NIDDM) [1-5].

The majority of the 382 million people with diabetes are aged between 40 ─ 59 and 80% of them are live in low-and middle-income countries, All types of DM are on the increase, The number of people with diabetes will increase by 55% by 2035. In 1900, Karl Landsteiner (1900) discovered ABO blood group system and he also succeeded to identify four types of blood groups group A, group B, group AB, and group O respectively, Each allelic form of ABO blood groups is A, B, AB and O respectively, each of them has the responsibility to produce its own glycoprotein,The gene that is responsible for the determination of ABO blood type is present on chromosome number-9 and is called ABO [6].

Since the discovery of ABO system by Karl Landsteiner in 1900, many researchers took their interest to conduct their own research studies to find out any association of ABO blood group with diseases. Genetic Science have confirmed that some genetic factors are involved which cause Diabetes Mellitus (DM), Similar strong evidences do exist that ABO/Rh blood systems are genetically determined as described earlier. Hence, DM and ABO/Rh blood system both have a common association/linkage with genetic integrations & both have their respective genetic factors/ genes [7].

Despite that, some epidemiological studies discussed the linkage between ABO blood group and the risk of developing diabetes mellitus, but findings were not

consistent and not yet clarified. Therefore, Patients with type 1 diabetes develop overweight and obesity in early adulthood more frequently than the general population and are characterized by higher body fat mass, Gender-related differences in body weight and composition in young type 1 diabetic adults were found[8].

Diabetes is justly recognized as an emerging global epidemic, representing one of the leading causes of morbidity and mortality worldwide, Hyperglycemia, the common characteristic of both type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), has the potential to cause serious complications due to its insidious and chronic nature, The present special issue has been designed to publish original and review articles highlighting recent fundamental advances in our understanding of diabetic complications, Emphasis has been given on the underlying molecular mechanisms, the new technologies that have been introduced to facilitate early diagnosis, and the new potential therapies for these complications [9].

Obesity and type 2 diabetes mellitus (T2DM) are two of the most common metabolic disorders in the world, Both have significantly increased during the last decades , In China, the prevalence of obesity and T2DM is similar to the worldwide statistics, In China it is estimated that the number of people with diabetes was 98.4 million 2013 and will reach 142.7 million by 2035 [10].

Patients with type 1 diabetes develop overweight and obesity in early adulthood more frequently than the general population and are characterized by higher body fat mass [8]. Being of an older age had a direct effect on increased blood glucose, blood cholesterol, and blood pressure, while a higher BMI had a direct effect on increased blood pressure, As women get older, maintaining a normal BMI is beneficial to preventing the increase of their blood glucose, blood cholesterol and blood pressure[11].

Diabetes is commonly associated with high blood sugar and insulin resistance or its decreased secretion and is the third leading cause of death across the world after cardiovascular disease and cancer , Diabetes is linked with some microvascular and macrovascular complications, which are associated with life-threatening disorders and reduced quality of life in diabetic patients[12]. Patients with diabetes run a 20-fold higher chance of developing cardiovascular disease and nephropathy than healthy people [8]. Blood sugar control can delay many of the acute and chronic complications of diabetes [12].

1.1.2 Children who are at increased risk of diabetes

Type 1 diabetes is one of the most common endocrine diseases in children. Worldwide, an estimated 65,000 children under 15 years old develop the disease each year, and the global incidence in children continues to increase at a rate of three per cent a year[13]. one of the most common chronic medical disorders in children,The management of diabetes remains a substantial burden on children with diabetes and their families, despite improvements in treatment and rates of morbidity and mortality[14].

The chances of developing it may depend on a mixture of factors--genetic, lifestyle and environmental factors[13].Type 1A diabetes results from chronic, progressive T-cell-mediated autoimmune destruction of the β-cells of the pancreas, eventually leading to severe insulin deficiency, manifested by low or undetectable plasma levels of C-peptide, Atypical forms of diabetes mellitus have been described in various populations and have been referred to as Flatbush diabetes,

atypical diabetes mellitus[15].

Type 1 and type 2 diabetes affect about 186,000 youth under age 20, Previously considered an adult disease, type 2 diabetes is becoming increasingly common in

overweight minority youth over 10 years of age, Criteria help to identify young people at risk for type 2 diabetes as well as those with the disease[16].

Diabetes therapy focuses strongly on targets for good metabolic control to reduce the risk of long-term complications, A parallel goal is to minimise short-term complications of hypoglycaemia and diabetic ketoacidosis, Technology offers opportunity for improvement in care, but has not yet fully lived up to its potential,New insights into the pathogenesis of diabetes and the development of new therapies have led to clinical trials aimed at the prevention of diabetes[14].

Diabetes prevention trials in Finland and the U.S. showed that nutrition and lifestyle approaches delay the onset of the disease 59, 60, In middle-aged, overweight subjects with IGT in Finland, reducing weight, total intake of fat, and intake of saturated fat, and increasing consumption of fiber and physical activity decreased the cumulative incidence of diabetes after 4 years to 11% in the intervention group compared to 23% in the control group, The risk of diabetes was reduced by 58% [15].

Prevention or delay of type 2 requires weight loss through healthy eating, portion control and increased physical activity, along with family counseling and support. Type 1 diabetes usually has an acute onset and needs prompt diagnosis and treatment, It is important not to confuse its diagnosis with gastroenteritis ,For both types of diabetes, management is determined by the family and diabetes care team depending on the child's type of diabetes and individual needs[16].

Healthy eating and daily physical activity are key components. For those using glucose lowering medications, especially insulin (which is essential for type 1 diabetes), avoiding low blood glucose is important, Careful ongoing management of diabetes contributes to well-being and the avoidance or delay of onset of the long

term diabetes complications. These complications affect normal function of the eyes, nerves, kidneys and cardiovascular system, Psychological support helps youth cope with the ongoing demands of diabetes management. Educators can help ensure the child's full participation in school activities[16].

1.2 Blood Groups

The "ABO" system consists of 4 major "ABO" phenotypes "A", "B", "O", and "AB", Phenotypic ABO blood categories are polymorphic, inherited, antigenic chemicals found on the top of red blood cells in addition to cells of other tissues The blood class of a person identified by small carbohydrate epitopes is determined by the occurrence or absence of genes "A" and "B". The gene is put on chromosome 9q34 and contains 7 exons distributed pass on disperse over 18 kb called "ABO" blood classes [17].

The main human blood group system is ABO and their groups vary significantly in several races, ethnic groups and socio-economic groups in several parts of the world [18]. All human masses share the same blood group systems, although they differ in the rate of recurrence of certain species. Blood group antigens are specific genetic and play an essential role in disease susceptibility [19].

The absence and occurrence of antigens with the blood group have been associated with some diseases that screen a strong relationship with ABO/Rh blood classes, notably peptic ulcer and gastric tumor. ABO also safely related with pancreatic tumor [20-21].

Various data also display that colorectal malignancy, duodenal ulcer, an ovarian tumor comes with a connection with ABO blood type. Cardiovascular system disease such as disease is also related to ABO blood group [22]. Diabetes is the most worldwide problem in public health. Diabetes is a major global health problem and

is one of the most important contributing factors to early morbidity and mortality around the world [23].

The existing global amounts of diabetics are 382 million, and the quantity will probably be 592 million by the entire year 2035, Additionally, about 183 million people are unaware they have diabetes [24].

Diabetes has been substantive as a recent prevalent that is improving swiftly in producing countries. The causes of diabetes are complicated, but there are factors such as genetic, immunological and environmental factors which are involved. Diabetes has a genetic proneness, although environmental factors do play their role in its gene expression [25]. But still, limited studies are added in today's science literature about the relationship of "ABO" and "Rhesus" blood categories with type 2 DM [26].

Furthermore, this research endeavored to determine the possible relation between "ABO" and "Rhesus" blood classes with type 2 diabetes mellitus, DM and blood groups are related to the broad hereditary immunoglobulin base [27]. Identify a positive relationship between DM and blood groupings may reflect a greater susceptibility and an adverse affiliation for protection against diabetes. Researches by Penner, et al., reported that the presence of a family background of diabetes has led to an early onset of the illness to the offspring [28-30].

To determine the association between consanguineous marriages, obesity, and environmental risk factors associated with type 2 diabetes, in the adult Qatari population. Methods The case-control study was carried out among diabetic patients and healthy subjects at the Primary Healthcare Clinics (PHCs) and the survey was conducted from February to November 2003.The study included 338 cases (with diabetes) and 338 controls (without diabetes). Face-to-face interviews were based on a questionnaire that included variables such as age, gender, socioeconomic status,

parity, income level, cigarette smoking, physical activity, body mass index (BMI)[29].

obesity, and lifestyle. Their health status was assessed by medical conditions, family history, physical examination, blood pressure, blood glucose, blood count, lipid profile, cholesterol total, HDL, LDL, and triglycerides analysis. Results The mean age (in years±standard deviation) of cases versus controls was 45.5±8.9 vs 42.4±8.0, P [29]. Recently, the romantic relationship between ABO blood types and disease susceptibility has made a lot of attention [31].

Blood groupis a type of proteins and sugars that are found on the surface of red blood cells and give the blood its type,There are multiple blood testing systems, but there are two basic systems : the blood group system, which is symbolized by the abbreviation ABO, and the rhesus system, which is symbolized by Rh,Blood types have been divided according to the presence or absence of antibodies on the surface of red blood cells_1-The ABO system , which contains the most common blood groups with the blood group[32].

1.2.1 type of blood group

1-Blood group A: has antigens in red blood cells for blood group A with antibodies for blood group B in the plasma,

2-Blood group B: has antigens in red blood cells for blood group B along with antibodies for blood group A in the plasma,

3-Blood type AB: has antigens in red blood cells for types A and B, but no antibodies,

4-Blood group O: Has no antigens, but has both blood group A and B antibodies in tha plasma,[32].

1.2.3 Rare blood types

Blood types are linked to genetics , so the prevalence or rarity of a group depends on the extent to which it is inherited across generations, and therefore the distribution of blood groups varies in different parts of the world,However, negative blood types are considered the rarest blood type in the world, and blood types are classified from rarest to least according to the following ratios:

AB negative: 0.6%, B negative: 1.5%, AB positive: 3.4%, A negative: 6.3%, O negative: 6.6%, B positive: 8.5%, A positive: 35.7%, O positive: 37.4% [32].

RhD system Red blood cells sometimes contain antigens for another protein known as RhD antibody, which determines whether a blood type is positive or negative,If this antibody is present, the blood type is RhD positive, Or if it is absent, the blood type is RhD negative [33].International Society of Blood Transfusion has recently recognized 33 blood group systems. Apart from ABO and Rhesus system, many other types of antigens have been noticed on the red cell membranes. Blood grouping and cross-matching is one of the few important tests that the anaesthesiologist orders during perioperative period. Hence, a proper understanding of the blood group system, their clinical significance, typing and cross-matching tests, and current perspective are of paramount importance to prevent transfusion-related complications, The term “blood group” refers to the entire blood group system comprising red blood cell (RBC) antigens whose specificity is controlled by a series of genes which can be allelic or linked very closely on the same chromosome, “Blood type” refers to a specific pattern of reaction to testing antisera within a given system [34].

The main human blood group system is ABO and their groups vary significantly in several races, ethnic groups and socioeconomic groups in several parts of the world. All human masses share the same blood group systems, although they differ

in, the rate of recurrence of certain species, Blood group antigens are specific genetic, and play an essential role in disease susceptibility [35] .The absence and occurrence of antigens with the blood group have been associated with some diseases that screen a strong relationship with ABO/Rh, blood classes, notably peptic ulcer and gastric tumor. ABO also safely related with pancreatic tumor [36].

malignancy, duodenal ulcer, an ovarian tumor comes with a connection with, ABO blood type. Cardiovascular system disease such as disease is also related to ABO blood group[37].

1.3 Relationship between diabetics and blood groups

At present, diabetes mellitus (DM) is recognized as a global major public health problem that contributes to ill health, premature mortality and morbidity in the worldwide. Nowadays, there are three commonly known types of diabetes. These are type 1 type 2 and gestational diabetes. Mostly all this type of diabetes can coexist with hypertension and obesity at high frequency[38].

Scientists suggest that people suffering from DM were increasing due to socio-demographic factors or genetic changes, socio-demographic factor which may have a contribution for DM include population growth, aging, urbanization, low physical activity, and the high prevalence of obesity[39].

Additional to socio-demographic factors, over the past years in the 19th century, researchers have found out the relationship between particular blood groups and increased susceptibility to inherited traits and many hereditary diseases[40].

including diabetes and cancer,The major human blood group system is ABO based on A and B antigen, and also depends on the presence or absence of Rhesus (Rh) antigens, blood group classified into Rh positive or negative[41]. This system is one of such genetic make-up of an individual that will provide much valuable

information for each person[42]. However, the association between the distribution of the ABO blood types and diseases is conflicting because no diseases are known to result from the lack of expression of ABO blood group antigens[43].

Diabetes mellitus (DM) is a syndrome characterized by hyperglycemia resulting from defects of insulin secretion and/or increased cellular resistance to insulin, DM is generally divided as insulin-dependent diabetes , mellitus (IDDM or type I), characterized by an absolute , deficiency of circulating insulin and non-insulin-dependent diabetes mellitus (NIDDM or type 2), characterized , by elevated insulin levels that are ineffective in normalizing blood sugar levels or by impaired insulin secretion [44].

was reported that DM type 2 is the most common types type, accounting for 9095% of all diabetic cases[45]. In 1998 it was estimated that there were almost 140 million people with diabetes and the predictions by Hilary King indicate that this figure would rise up to 300 million by the year 2025[46].

The major human blood group system is ABO, The blood group of a person depends upon the presence or absence of two genes, A and B. The majority of ABO determinants are expressed on the ends of long poly lactosamine chains[47].

Several studies related to the ABO phenotype show that genetically determined human ABO blood groups were correspondingly linked with an increased risk of various infectious and noninfectious diseases. However, further investigations are needed particularly on the molecular level of ABO blood groups and their association with various diseases [48].

indicates that there was no connection between the Rh blood type and risk of type 2 diabetes mellitus (T2DM). However, individuals with blood type O shows the lowermost risk of T2DM, whereas those with blood type B were at the uppermost

risk, followed by type AB and type A individuals; nevertheless, the risk for type AB people did not have statistical implication[49].

When Rh and ABO types were assessed together, blood type B+ persons showed the uppermost risk, followed by type AB+, A–, and A+ persons, but similar risk was seen for the other types . There is a strong indication of an association of diabetes mellitus with blood groups, especially with A, AB and Rh-positive blood groups. The maximum differences are in the AB groups in the two series and minimum in the A group. Individuals with gene p seem to be more susceptible to this disease. Thus the association between blood groups and diabetes mellitus is not a chance finding, but implies an aetiological relationship[50].

Blood group “B” was associated with high incidence of type 2 diabetes and blood group “O” has a minimum association with type 2 diabetes. Blood group “A” and “AB” were almost equally distributed in both diabetic and non-diabetic population, However, we were unable to find an association between “Rh+ ve” and “Rh-ve” blood groups with type 2 diabetes. Subjects with blood group “B” are at high risk while individuals with blood group “O” are at low peril of evolving type 2 diabetes, It is suggested that subjects with blood group “B” should be closely monitored by physicians as these subjects have an increased risk of type 2 diabetes[51].

2- material and method

A number of samples (97) were taken from people of different sexes (male, female) and different ages, ranging from (7-80), through two methods.

2.1 Method of measuring sugar

When measuring blood sugar, we use a blood sugar meter by taking a small sample of blood, usually taken from the patient's fingertip, and placed on a disposable measuring tape.

Tools "

Blood sugar device, measuring tape, needle, sterilizer, cotton

A.The method of work

1- Wash your hands and dry them well

2- Insert the measuring tape into the diabetes device

3- Use a needle to prick the tip of the patient's finger

4- Touch the blood point with the edge of the measuring tape and hold it steady

5-The blood sugar level measurement is displayed on the device screen after a few seconds [52].

The normal blood sugar range is 90-120

When high blood sugar is 200 or more

The decline is less than 80[53].



2.2 Blood group

Each person's blood types are. different. Every person has a specific blood type that belongs to one of the following four groups:

A,B,AB,O

Each group differs from the other due to the presence of certain substances in blood cells and serum. If two completely incompatible groups are mixed, an imbalance occurs that may have serious consequences.

Tools"

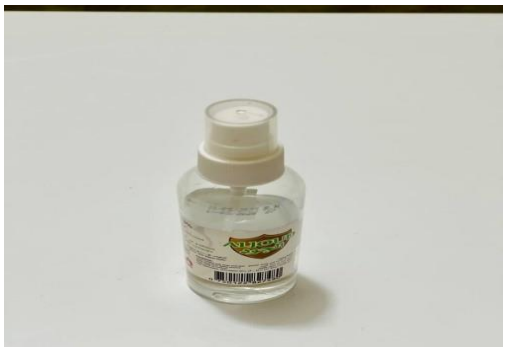
Blood group ‹Lancet ‹cotton‹

disinfected ‹Slides ‹Sticks









B. Method of work

1. Prick the thumb and but 3 drops from the blood on deferent site one the slide.

2. Put 1 drop of anti-A on the 1st blood sample and mix.

3. Put 1 drop of anti-B on the 2nd blood sample and mix

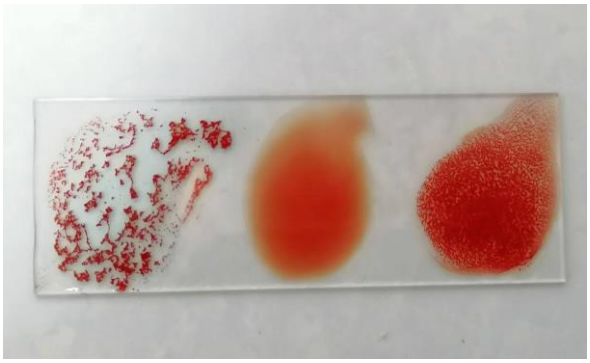
4. Put 1 drop of anti-D on the 3rd blood sample and mix.

5. Mix the cells and reagent using a clean stick

6. leave the test for 2 minutes at room temperature (22°- 24°C). Then look for agglutination. [54]









3-Results and discussion

Table 1 nidicates Blood graup O is predominantin in distribution with the highest freauency (40%),followed by blood group B (26%),A(19%), and AB(18%).

Table 1. shows freauencies of ABO of blood groups and mean blood sugar inthe stndy population.

Blood type	Number of subjects [N]	Percen Tage	Mean SBP in mmHg [Mean+SD]	Mean DBP in mmHg [Meam+SD]
A	**N= 17**	**19%**	**259.1765**	**77+8.1**
B	**N=24**	**26%**	**123.3+2.3**	**74+9.7**
AB	**N=16**	**18%**	**118+7.4**	**77.3+11.5**
O	**N=39**	**40%**	**120+9.4**	**78.6+7.2**

Table shows there number of subjects with elevated bloodsugar was O blood group, The majority of people with diabetes are blood type O,

we can also find in table 1, the mean systolic Blood sugar (SBP) and to singnificant difference in the mean Diastpile Blood sugar(DBP) of ABO group. Table 2

indicates there ison significant association of elevated blood sugar with A ,B and O and AB blood gronps.

Table 2. Distribution of ABO blood graup system in subjects with normal and elerated bolood sugar

Blood type	**Subjects whith hormal blood sngar N=7**	**Subjects whith have abnormal blood sugar N=90**
A	**1**	**16**
B	**2**	**22**
AB	**1**	**15**
O	**3**	**36**

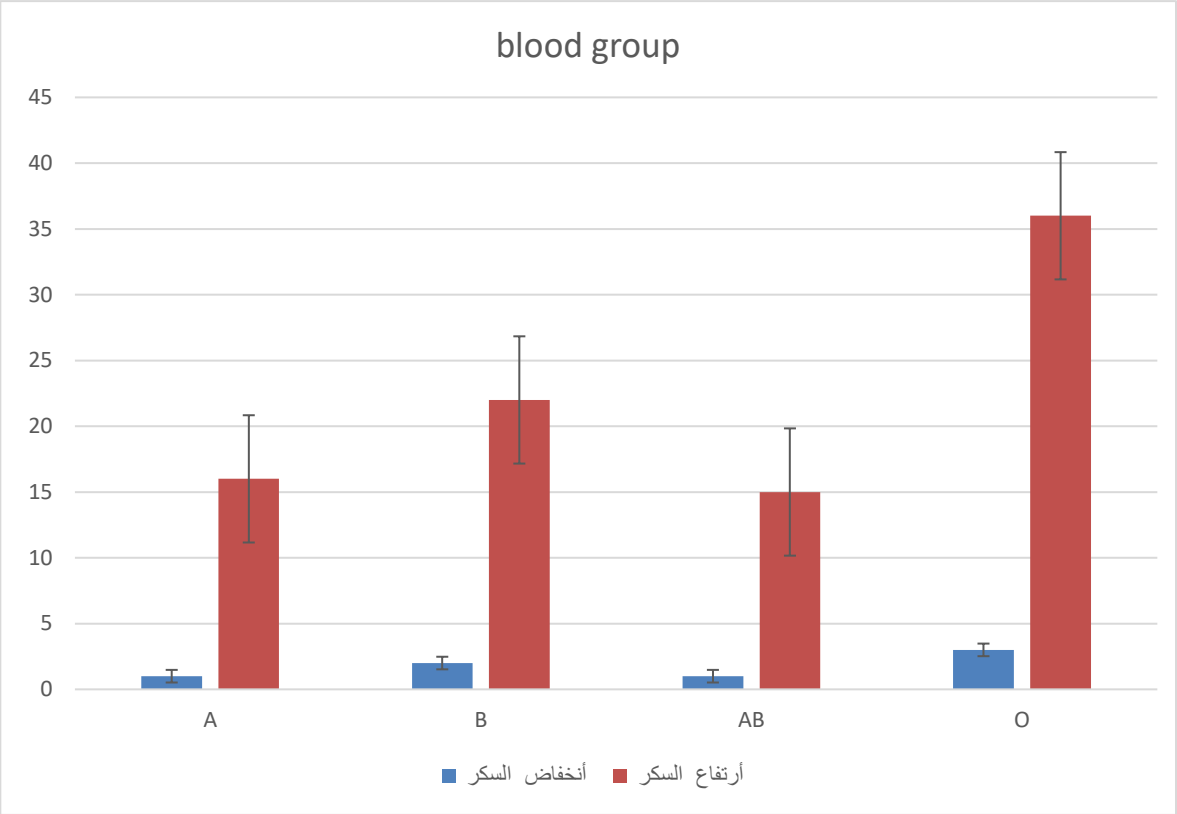


figure display normal and elevated blood sugar in blood groups

The results were examined in several studies, for example(Association of blood groups/Rh and diabetes mellitus in Karachi city, Pakistan)

The main purpose of this study was to discover Rh and ABO and a possible relationship between blood types,

The effect of diabetes and its association with blood types has been discovered by many researchers in different populations,

In this study in the city of Karachi, a survey was conducted for several groups, and (584) samples were collected from different cities and for different ages, ranging from 40 to 70 years. The overall distribution of blood types was

A+=87 , A-=26 , B+=118 , B-=20 , AB+=84 , AB-=22 , O+=56 , O-=19

It was noted that the percentage of blood type (118=+B) was the highest group in the group system, and (19=-O) was the lowest group in the group system [55].

Our research results(The relationship between diabetics and blood groups)The results of this search do not match(Association of blood groups/Rh and diabetes mellitus in Karachi city, Pakistan).

This cross-sectional study was also conducted on 250 patients with diabetes at Sheikh Zayed Hospital (130 males, 120 females aged between 15 and 70 years),

The frequency of ABO and Rh blood groups in patients with diabetes mellitus in the population-based group was recorded as

A+=52, A-=2, O+=97, O-=10, AB+=23, AB-=3, B+=55, B-=8

The blood type with the highest prevalence of diabetes was (97 = +O) and (2 = -A) was the lowest prevalence of diabetes[56].

Also, the results of our research(The relationship between diabetics and blood groups)It matches the results of this research(Frequency of ABO and Rh blood groups in patients with diabetes mellitus)

1.5 Conclusion

Through study and research on a topic (The relationship between diabetes and blood groups)

In addition, delve deeper into it through statistics that were conducted on a number of people with diabetes, approximately (97) samples, for different groups of gender and age, and for different groups.

Diabetes affects all ages, from 7 to 80 years. Type 1 diabetes may begin at any age, while type 2 is the most common and affects people over the age of 40.

The type most affected by diabetes (O+) and the male gender is more susceptible to the disease

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