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Blood Group and its Relationship with Diabetic

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ABSTRACT

Objective: *Diabetes is described in this article as a metabolic disease that results in hyperglycemia, or elevated blood sugar. DM pathophysiology may be divided into two primary groups. type 1 and type 2 Its connection to blood types is examined. The four basic "ABO" phenotypes – "A," "B," "O," and "AB" – make up the "ABO" system. ABO phenotypic blood types are polymorphic, genetic, antigenic substances found on the surface of red blood cells as well as other organ cells.* ***Method:*** *From people of both sexes (male and female), with ages ranging from 7 to 80, 97 samples were taken. People with diabetes may be anywhere from 7 to 80 years old, based on blood sugar levels.* ***Results:*** *In contrast to type 2 diabetes, which is more common in those over 40, type 1 diabetes may develop at any age. O+ diabetes is the most common form, and men are more likely than women to get it. The highest blood sugar level for a person aged 30 was 600. The lowest percentage is 91 for a person who is 27 years old. O+ was shown to be the kind most affected by diabetes. Blood group AB is the one least affected by diabetes.* ***Novelty:*** *If genes "A" and "B" are present or absent, the individual's blood class is determined by small carbohydrate epitopes. Scattered over 18 kb, the gene's seven exons are referred to as "ABO" blood types. It is located on chromosome 9q34.*

INTRODUCTION

Numerous investigations were conducted in an attempt to determine if ABO blood types and diabetes mellitus (DM), a prevalent metabolic disease characterised by high blood glucose levels as a result of decreased insulin synthesis, are related. ABO blood types and diabetes mellitus were shown to be strongly correlated [1]. The type of blood, sometimes referred to as the blood group or blood type, is determined by the proteins and carbohydrates found in red blood cells. There are a number of blood testing techniques, but the two most basic ones are the blood group system, denoted by the abbreviation ABO, and the rhesus system, denoted by Rh [2].

Diabetes

Diabetes is a metabolic disease that causes high blood sugar, or hyperglycemia. Diabetes mellitus (DM) may be divided into two primary types: The insulin hormone is absent from the blood of patients with type-I diabetes mellitus (TIDM). The patient has to get an insulin injection to make up for this deficiency. As a result, type 1 diabetes was formerly known as Insulin Dependent Diabetes Mellitus (IDDM) [3].

Moreover, individuals with T1DM who are first misdiagnosed as having T2DM because of age rather than aetiology have a relatively new disease called Latent Autoimmune Diabetes of Adult (LADA). Although Type-2 DM patients' pancreatic β-cells may produce enough insulin hormone, a malfunction at the receptor region hinders or resists their activity or physiology [4].

Even if the blood has a sufficient amount of the hormone insulin, it is not working properly and cannot help cells or tissues absorb blood glucose. Hyperglycemia is a condition when blood glucose levels rise as a result of this insulin receptor blockage or resistance. Insulin resistance and a relative lack of insulin production are two possible outcomes of type 2 diabetes. Since the patient does not need insulin injections, type 2 diabetes was formerly called as Non-Insulin Dependent Diabetes Mellitus (NIDDM) [1–5].

The prevalence of all types of diabetes is rising, and by 2035, there will be 55% more persons with diabetes overall. Eighty percent of the 382 million people with diabetes live in low- and middle-income countries, and the majority are between the ages of 40 and 59. Not only did Karl Landsteiner develop the ABO blood group system in 1900, but he also identified four other blood groups: A, B, AB, and O. The production of glycoprotein is the responsibility of each of the four allelic forms of the ABO blood group: A, B, AB, and O. The ABO gene, which is found on chromosomal number nine, is responsible for determining an individual's ABO blood type [6].

Other researchers have been interested in carrying out their own studies to see if there is a correlation between diseases and an ABO blood type since Karl Landsteiner created the ABO system in 1900. Diabetes mellitus (DM) is caused by certain hereditary characteristics, according to genetic research. As previously stated, there is strong evidence that the ABO/Rh blood systems are genetically determined. As a result, diabetes mellitus and the ABO/Rh blood system both have their own genetic factors and genes and are linked to genetic integrations [7].

The association between ABO blood type and the likelihood of developing diabetes mellitus has been the subject of several epidemiological research, although the findings have been ambiguous and contradictory. In young adults with type 1 diabetes, differences in body weight and composition were shown to be associated to gender [8]. Consequently, individuals with type 1 diabetes have a higher risk of being overweight or obese in their early adult years than the general population, and they are also distinguished by elevated body fat mass.

One of the main reasons for illness and death Diabetes is appropriately seen as an increasing disease on a worldwide scale. Hyperglycemia is a frequent symptom of both type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), and since it is chronic and deceptive, it may cause major consequences. This special issue's objective is to include both original and reviewed articles that showcase noteworthy advancements in our understanding of the complications related to diabetes. Attention has been paid to the underlying biological processes, new technologies that help with early identification, and innovative potential solutions for these issues [9].

Type 2 diabetes mellitus (T2DM) and obesity are two of the most common metabolic illnesses in the world, and their prevalence has increased significantly in recent years. In China, the rates of obesity and type 2 diabetes are similar to those worldwide. China's diabetes population is expected to increase from an estimated 98.4 million in 2013 to 142.7 million by 2035 [10].

People with type 1 diabetes have higher body fat mass and are more likely than the general population to be overweight or obese in their early adult years [8]. Blood pressure increased proportionately to a higher body mass index, while blood pressure, blood cholesterol, and blood glucose all increased in direct proportion to age. Women may prevent their blood pressure, blood cholesterol, and blood glucose levels from increasing as they age by maintaining a normal body mass index (BMI) [11].

After heart disease and cancer, diabetes is the third most common cause of mortality globally. It is often associated with reduced secretion, insulin resistance, or elevated blood sugar. Additionally, diabetes is associated with certain microvascular and macrovascular problems, associated with potentially fatal illnesses and a worse quality of life for those with diabetes [12]. Diabetics are 20 times more likely to develop cardiovascular disease and nephropathy than healthy people [8]. Blood sugar control may delay many of the immediate and long-term effects of diabetes [12].

Children who are at increased risk of diabetes

Type 1 diabetes is among the most common endocrine conditions in children. It is estimated that 65,000 children under the age of 15 are affected by the disorder globally each year, and its prevalence in children is increasing at a rate of 3% each year [13]. of the most common chronic diseases in children, for children with diabetes and their families, managing the condition remains a major burden despite improvements in treatment and rates of morbidity and mortality [14].

The chance of developing it may be influenced by a mix of genetic, behavioural, and environmental factors [13]. Type 1A diabetes results from the chronic, gradual autoimmune destruction of the pancreatic β-cells by T-cells, which leads to low or undetectable plasma levels of C-peptide, an indication of acute insulin shortage. Atypical types of diabetes mellitus that have been documented in several cultures are referred to as flatbush diabetes and atypical diabetes mellitus [15].

Approximately 186,000 youths under 20 suffer from either type 1 or type 2 diabetes. Previously believed to be an adult ailment, type 2 diabetes is becoming common among overweight minority children over the age of 10. Criteria may be used to identify people with type 2 diabetes as well as those who are at risk developing the disease [16].

Diabetes therapy heavily emphasises goals for excellent metabolic control to reduce the likelihood of long-term issues. Another goal is to lessen the immediate effects of hypoglycemia and diabetic ketoacidosis. Technology has the potential to improve care, but its full potential has not yet been reached. Improved knowledge of the pathophysiology of diabetes and the development of new medications have spurred clinical research for diabetes prevention [14].

Diabetes prevention studies in Finland and the United States have shown that lifestyle and nutrition choices may delay the onset of diabetes 59, 60. After four years, the cumulative incidence of diabetes in middle-aged, overweight adults with IGT in Finland decreased to 11% in the intervention group from 23% in the control group by lowering weight, total fat consumption, and saturated fat intake while also boosting fibre and physical activity. The risk of diabetes was lowered by 58% as a consequence [15].

To prevent or delay type 2, weight loss by portion control, a healthy diet, and more activity is required in addition to family therapy and support.

Since type 1 diabetes sometimes strikes unexpectedly, early identification and treatment are essential. Differentiating this diagnosis from gastroenteritis is essential. The family and diabetes care team choose how to manage both types of diabetes based on the child's unique needs and the kind of diabetes they have [16].

A balanced diet and consistent exercise are the two key components. For those on glucose-lowering medications, especially insulin, which is required for type 1 diabetes, preventing low blood glucose is essential. Two advantages of meticulous diabetes management include preserving health and avoiding or postponing the development of long-term diabetic complications. These problems affect the regular function of the kidneys, cardiovascular system, nerves, and eyes. Young people who get psychological support are better equipped to cope with the ongoing challenges of diabetes management. Instructors can ensure that the child engages completely in class activities [16].

Blood Groups

The "ABO" system is comprised of four primary "ABO" phenotypes: "A," "B," "O," and "AB." The polymorphic, genetic, antigenic chemicals found on the surface of red blood cells and cells from other organs are referred to as phenotypic ABO blood categories. A person's blood class is determined by the presence or absence of genes "A" and "B" based on microscopic carbohydrate epitopes. The seven exons of the gene, which is found on chromosome 9q34, are dispersed throughout 18 kb and are known as "ABO" blood classes [17].

The main blood group system for humans is ABO, and its groups vary widely across different ethnic, cultural, and socioeconomic groups worldwide [18]. All human masses have the same blood group systems, despite the fact that certain species recur at different rates. A person's susceptibility to disease is mostly determined by certain genetic blood type antigens [19].

The presence or absence of antigens associated with the blood type has been connected to some conditions that screen strongly for ABO/Rh blood classes, such as peptic ulcers and stomach tumours. ABO is securely linked to pancreatic tumours [20–21].

Numerous studies have also connected the ABO blood type to ovarian tumours, duodenal ulcers, and colon cancer. Cardiovascular disorders are also associated with ABO blood type [22]. Worldwide, diabetes is the most common public health concern. Diabetes is a major global health problem and one of the main causes of early morbidity and mortality globally [23].

By 2035, there will probably be 592 million diabetics globally, up from the current 382 million. Additionally, some 183 million people are unaware that they have diabetes [24].

Diabetes is a modern, common ailment that is getting better quickly in producing countries. Diabetes has many different origins, but genetic, immunological, and

environmental factors all play a part. Diabetes has a genetic propensity, but environmental factors affect how its genes are expressed [25]. The relationship between type 2 diabetes and the "ABO" and "Rhesus" blood types, however, is still not well explored in the scientific literature [26].

This research also sought to determine if blood groups associated with the broad hereditary immunoglobulin base [27] and "ABO" and "Rhesus" blood classes are related to type 2 diabetes mellitus, or DM. A negative connection with prevention and a greater risk for diabetes mellitus might be indicated by a positive correlation between blood groups and the condition. Children with a family history of diabetes are more likely to have the condition early in life, according to study by Penner et al. [28–30]. to determine if there is a correlation between consanguineous marriages, obesity, and environmental risk factors for type 2 diabetes in Qatari adults. Methods As part of a case-control study, a survey of both healthy individuals and diabetic patients was conducted at Primary Healthcare Clinics (PHCs) between February and November 2003. The study included 338 individuals with diabetes and 338 controls without the disease. In-person interviews were conducted using a questionnaire that included information on age, gender, parity, income level, socioeconomic status, cigarette smoking, physical activity, and body mass index (BMI) [29].

Obesity and lifestyle. Their health was assessed using a variety of methods, including medical conditions, family history, physical examination, blood pressure, blood glucose, blood count, lipid profile, total cholesterol, HDL, LDL, and triglycerides analysis. Results The mean age (in years±standard deviation) of patients was 45.5±8.9 vs. 42.4±8.0, P [29] compared to controls. The romantic relationship between ABO blood types and sickness risk has received a lot of attention lately [31].

Blood types are determined by certain proteins and carbohydrates termed blood groups found on the surface of red blood cells. The rhesus system, denoted by the letter Rh, and the blood group system, denoted by the abbreviation ABO, are the two basic blood testing techniques, however there are many more. The ABO system, which separates blood types according to whether or not red blood cells have antibodies on their surface, includes the most common blood groups [1–32].

Type of blood group

1. Red blood cells with blood group A antigens and plasma with blood type B antibodies are seen in blood group A.
2. Blood group B: includes antigens for blood group B in red blood cells and antibodies for blood type A in plasma.
3. Antigens for types A and B are present in red blood cells of blood type AB, but no antibodies are present.
4. Blood group O: Does not have antigens, although the plasma contains both blood group A and B antibodies [32].

Rare blood types

The distribution of blood groups varies around the world due to the relationship between blood types and heredity, and the degree to which a group is handed down

through the generations determines its frequency or rarity. Conversely, it is stated that negative blood types are the rarest in the world. Blood types are ranked from rarest to least using the following ratios:

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

The RhD system Red blood cells may sometimes include antigens for a separate protein termed RhD antibody, which determines whether a blood type is positive or negative. If this antibody is present, the blood type is RhD positive; if not, it is RhD negative [33]. The International Society of Blood Transfusion recently acknowledged 33 blood group systems. In addition to the ABO and Rhesus systems, the membranes of red blood cells have been shown to contain a wide variety of antigens. Blood grouping and cross-matching are among the few essential tests that the anaesthesiologist requires during the preoperative stage. Therefore, in order to reduce problems related to transfusions, it is essential to have a comprehensive understanding of the blood group system, its clinical importance, typing and cross-matching tests, and modern viewpoints. While "blood group" refers to the entire blood group system composed of red blood cell (RBC) antigens whose specificity is regulated by a number of genes that can be allelic or closely linked on the same chromosome, "blood type" refers to a specific pattern of reaction to testing antisera within a given system [34].

Other ethnic, cultural, and socioeconomic groups across the world have somewhat varied blood groupings, but ABO is the main human blood group system. All human masses have the same blood group systems, even if certain species recur more often than others. A person's susceptibility to disease is largely determined by certain genetic blood type antigens [35]. The presence or absence of antigens associated with the blood type has been connected to some conditions that screen strongly for ABO/Rh blood classes, such as peptic ulcers and stomach tumours. ABO is also reliably linked to pancreatic tumours [36].

An ABO blood type is linked to cancer, duodenal ulcers, and ovarian tumours. Cardiovascular disorders are also associated with ABO blood type [37].

Relationship between diabetics and blood groups

Nowadays, diabetes mellitus (DM) is recognised as a major worldwide public health concern that contributes to morbidity, premature mortality, and ill health. Nowadays, three types of diabetes are commonly acknowledged. These include type 1 diabetes, type 2 diabetes, and gestational diabetes. This kind of diabetes often coexists with obesity and hypertension [38].

Scientists believe that either genetic or sociodemographic factors are contributing to the growing number of people with diabetes mellitus. Sociodemographic factors that may contribute to DM include the high prevalence of obesity, inadequate physical exercise, urbanisation, ageing, and population growth [39].

Along with sociodemographic factors, during the later decades of the 19th century, scientists have found a connection between certain blood types and increased susceptibility to inherited traits and a number of genetic illnesses [40].

Like diabetes and cancer, The A and B antigens serve as the foundation for the main human blood group system, or ABO. Additionally, depending on the presence or absence of Rhesus (Rh) antigens, it establishes whether a blood group is Rh positive or Rh negative [41]. One of the genetic elements of an individual that will provide them a plethora of helpful information is this system [42]. The association between the distribution of ABO blood types and diseases is counterintuitive, nevertheless, since no disorders are known to result from the lack of expression of ABO blood group antigens [43].

Hyperglycemia caused by deficiencies in insulin production and/or increased cellular resistance to insulin is a hallmark of the illness known as diabetes mellitus (DM). DM is usually divided into two categories: insulin-dependent diabetes mellitus (IDDM or type I), which is characterised by a complete lack of circulating insulin, and non-insulindependent diabetes mellitus (NIDDM or type 2), which is characterised by impaired insulin secretion or elevated insulin levels that are ineffective in bringing blood sugar levels back to normal [44].

Kind 2 diabetes is the most common kind of the disease, accounting for 9095% of all cases [45]. In 1998, it was estimated that around 140 million people had diabetes, and Hilary King predicted that by 2025, that figure would rise to 300 million [46].

The main human blood group system is ABO. A person's blood type is determined by the presence or absence of two genes, A and B. The majority of ABO determinants are expressed on the ends of long polylactosamine chains [47].

Numerous studies on the ABO phenotype have linked genetically determined human ABO blood types to an increased risk of a variety of infectious and noninfectious illnesses. However, additional study is needed, particularly on the molecular basis of ABO blood types and their associations with other diseases [48].

Demonstrates that the Rh blood type has no bearing on the risk of type 2 diabetic mellitus (T2DM). Those with blood type O, on the other hand, had the lowest chance of type 2 diabetes, but those with blood type B had the greatest risk, followed by those with blood types AB and A. Nevertheless, there was no statistically significant risk for those with type AB [49].

When comparing Rh and ABO types, those with blood type B+ were at the greatest risk, followed by people with blood types AB+, A–, and A+; however, the risk was similar for the other kinds. Blood types, especially A, AB, and Rh-positive blood types, are strongly associated with diabetes mellitus. Between the two series, the AB groups have the most deviations, while the A group has the fewest. It seems that people with gene p are more likely to have this problem. Consequently, rather than being a fortuitous finding, the association between blood types and diabetes mellitus points to an etiological relationship [50].

While blood group "B" has been associated with a significant incidence of type 2 diabetes, blood group "O" has the lowest association with the condition. Blood types "A" and "AB" were almost equally distributed in the diabetic and non-diabetic populations; however, we were unable to find any association between type 2 diabetes and blood types "Rh+ve" and "Rh-ve." While those with blood group "O" are less likely to acquire type 2 diabetes, individuals with blood group "B" are more likely to do so. Given their increased risk of type 2 diabetes, physicians are advised to periodically examine people with blood group "B" [51].

RESEARCH 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.

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

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 stead.
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].

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

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. Give the test two minutes to sit at room temperature, which is between 22° and 24°C. Then look for agglutination [54].

RESULTS AND DISCUSSION

Table 1 indicates Blood group O is predominant in distribution with the highest frequency (40%), followed by blood group B (26%),A(19%), and AB(18%).

Table 1. frequencies of ABO of blood groups and mean blood sugar in the study population.

Blood type	Number of subjects [N]	Percentage	Mean SBP in mmHg [Mean+SD]	Mean DBP in mmHg [Mean+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 blood sugar 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 significant difference in the mean Diastole Blood sugar (DBP) of ABO group. Table 2 indicates there is on significant association of elevated blood sugar with A, B, O and AB blood groups.

Table 2. Distribution of ABO blood group system in subjects with normal and elevated blood sugar.

Blood type	Subjects with normal blood sugar N=7	Subjects with abnormal blood sugar N=90
A	1	16
B	2	22
AB	1	15
O	3	36

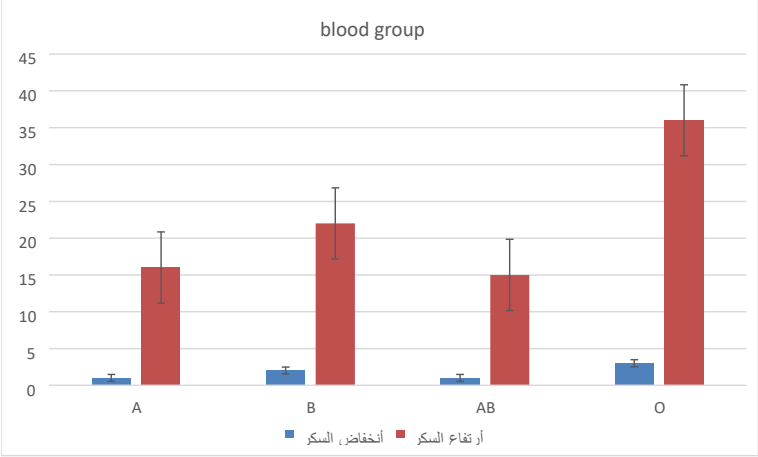

Figure 1. Display normal and elevated blood sugar in blood groups.

Several studies examined the results, including one that examined the connection between blood types and Rh and diabetes mellitus in Karachi, Pakistan. Finding Rh and ABO and any possible blood type correlations was the main objective of this investigation, 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).

CONCLUSION

Fundamental Finding : 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 people of all ages, from seven to eighty. Type 1 diabetes may begin at any age, but type 2 diabetes is the most common and often affects those over 40. **Implication :** The type most affected by diabetes (O+) and the male gender is more susceptible to the disease. These findings suggest that certain blood groups and gender may influence vulnerability to diabetes, highlighting the potential importance of personalized medical monitoring based on these variables. **Limitation :** Through statistics that were conducted on a number of people with diabetes, approximately (97) samples. The relatively small sample size limits the generalizability of the findings, and the representation of specific blood groups or age clusters may not reflect broader population patterns. **Future Research :** Delve deeper into it through statistics that were conducted on a number of people with diabetes. Future research should expand the sample size and include more diverse populations to verify the observed associations between blood group types and susceptibility to diabetes, as well as to explore the biological mechanisms underlying these trends.

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