THE STUDY OF ABO BLOOD GROUPS AND HAEMOGLOBIN GENOTYPES IN HASSAN USMAN KATSINA POLYTECHNIC, KATSINA, NIGERIA.

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Abstract
A total of 100 volunteer were randomly selected for this work. The volunteers were sent to General hospital Katsina for blood groups and haemoglobin genotype tests. The results show that 67 out of 100 have the normal haemogrlobin (AA), 39 of which belong to group O^+. 30 have the sickle cell trait (AS) of which 16 belong to group O^+. Only 2 individuals have the sickle cell disease (SS), and they also belong to group O^+. Blood group O^+ is the dominant blood group in Hassan Usman Katsina Polytechnic, Katsina.

Keywords: ABO, genotype, haemoglobin, blood group

Introduction

The Hassan Usman Katsina Polytechnic is owned by Katsina State Government. It was established in 1983, and is located in Katsina, the administrative headquarters and capital city of Katsina state. Katsina is geographically located at latitude B/W 11°07'49" N, 13°022'57" N longitude B/W 6°52'03" and 99°02'40"E (Sani, 1997). The Polytechnic is situated along Katsina-Dutsin-ma roads, neighbouring other academic institutions like Katsina Islamic University, Federal College of Education Katsina and the Umaru Musa Yar'adua University, Katsina. The Polytechnic run courses at Diploma and Higher National Diploma levels in Science, Technology and Engineering. It has an annual student population of about 6,000 every session (DAPP, 2014).

The ABO blood grouping and haemoglobin (Hb) genotypes are among the most important health parameters often ignored by most people. A significant percentage of people even among the educated elites do not know their blood group and genotype. The two are determined from blood and it seems that is where the relationship end. It is the aims of this work to determine if Hb genotype of an individual is dependent on his blood group.

Literature review

The ABO blood grouping in human was discovered by Karl Landsteiner in 1901, a discovery that led to safe blood transfusion (Waters, 1996). The ABO blood grouping was used as a base in the first attempt to classify human races by genetic traits (Cavalli-Sforza, 2009). All people belong to one of four blood groups: A, B, AB and O, depending on which alleles of the ABO genes they inherited. The three major alleles of this gene, A, B and O are present in almost all populations of the world but in different proportions. For example O blood is very common among native. Americans, type A is common in Central Canada and O blood less frequent. Types B and AB are rare or absent. In other continents one finds all the blood groups with some local variations (Cavalli-Sforza, 2009).

There are four types of group in the ABO blood grouping. These are designated by letter as A, B, AB and O. Group A blood contains red blood containing A substance on their surface and has an antibody directed against B substance. Group B contains B substance on the surfaces of its red blood cells and has an antibody directed against A substance. AB group contains both A and B substance but lack antibodies. Group O has none of the A and B substances but has the capability of forming antibodies against A or B substance during transfusion. This is why blood type O can be given to anybody, and is therefore known as universal donor. AB has no antibodies and can therefore received the other group and is known as universal recipient (Roberts, 1976), Microsoft Encarta, 2009).

The Rhesus factor is another form of blood property associated with ABO blood grouping. Rhesus factors were discovered in 1937 by Karl Landsteiner and Alexander Solomon Wiener who first discovered them in blood of a rhesus monkey (Microsoft Encarta, 2009). About 85% of people have the rhesus antigens and are said to be rhesus positive designated as Rh^+. The remaining 15% have no rhesus antigens and are said to be rhesus negative Rh^-. In blood group test, blood groups are presented as A^+, B^+, O^+, A^-, B^-, O^- etc. The + or – signs indicate presence or absence of rhesus antigen. The Rhesus factor is associated with haemolytic anaemia of the new born. Individual with Rh^- are usually rare in human population.

Human haemoglobin (Hb) is formed of two pairs of globin chains of which is attached one molecule of haem. Four types of Hb molecules are usually encountered, Hb A which is more than 95%, the normal condition. Hb A2 which is about 1 – 3.5%, is the second type, together with Hb A formed the characteristic Hbs found in the adult. The third type is Hb F and is the Hb found in foetal life, hence called foetal Hb (Brozovic and Henthorn, 1996). The fourth type of Hb is encountered in the sickle disease, and is called Hb S. The sickle cell disease is a collective name for a group of conditions of characterized by the formation of sickle shaped red blood cells and is common in people of African descent but also found in other ethnic groups (Brozovic and Henthorn, 1996). Haemoglobin S is much less soluble than the normal Hb and it begins to crystallize when the oxygen concentration falls, as it does in the capillaries of the tissues. This cause the red blood cells, normally biconcave disc-shaped, to assume the shape of a crescent or sickle. With this shape, the red blood cells become less efficient in carrying oxygen. The severe anaemia which results is generally fatal (Roberts, 1986).

The homozygous state Hb SS is the cause of sickle cell anaemia whose clinical disability arises from repeated episodes of vascular occlusion by sickled red cells resulting in acute crises and eventually in end-organ damage (Brozovic and Henthorn, 1996). The heterozygous state, Hb AS is called the sickle cell trait. This is very common and affects millions of people worldwide. The sickle cell disease is usually inherited in a simple mendelian fashion, when couples with sickle cell traits (Hb AS) marry each other (Sani, 2006). Other form of sickle cell disease is Hb SC. This is compound heterozygous state of Hb S and Hb C. it is a milder form of sickle cell disease (Brozovic and Henthorn, 1996, Sani, 2006). Another disease of haemoglobin is the thalassaemia. This is most common among the white races (Sani, 2006).

Materials and method

The sample size of this work is based on 100 per 1,000 of a population. A total of 100 volunteers were selected randomly from among the students of Hassan Usman Katsina Polytechnic irrespective of age, sex or year of admission. The volunteers were sent to General hospital Katsina where the genotypes and blood groups test were conducted in batches of 10 students per day over a period of two weeks. The test fees were heavily subsidized by the hospital from ₦350 to ₦150 per head. All the hospital protocol and procedures were strictly adhered to. The data obtained are presented in the result of this work.

Results and discussion

Table 1**:** ABO blood groups an Hb genotypes tests among 100 students of Hassan Usman Katsina Polytechnic, Katsina, Nigeria

Hb genotype	A^+	A^-	B^+	B^-	AB^+	AB^-	O^+	O^-
AA	16	02	07	0	03	0	039	0
AS	04	0	09	0	01	0	16	0
SS	0	0	01	0	0	0	02	0

The results shows that out of the 100 volunteers 67 have normal Hb (AA) and group O^+ alone has 39, followed by group A^+ 16, B^+ 7, AB^+ 03 and A^- 2. This shows that there is no relationship between blood group and Hb genotype. Blood group A^+ has only 16 AA as compared to O^+ with 39 AA. B^+ group and AB^+ are also possessing the normal Hb (AA). Individuals with blood group O^+ are the highest among the volunteers followed by group A^+ blood. 30% of the volunteers have the sickle cell traits and only 3% of the 100 volunteers have the SS genotype. The result also shows that individual with rhesus negative blood are fewer than those with rhesus positive blood. This explain why people with rhesus negative blood do not get blood donors easily during what the hospital people called grouping and cross matching. The study also shows that significant number of the students admitted into the polytechnic have normal Hb with few that have the sickle cell traits and insignificant number with the sickle cell disease.

Conclusion and recommendation

In conclusion, it can be said that the majority of students of Hassan Usman Katsina Polytechnic have normal haemoglobin (AA), and that blood group O+ is the predominant blood group. There exist individuals with the sickle cell traits among the students. Individuals with sickle cell disease are negligible. Rhesus positive blood predominates in all the groups.

Studies of this nature will usually recommend a blood test for genotype to intending couples to avoid sickle cell disease. People with rhesus negative blood should lead a very cautious life so as to avoid blood transfusion.

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