FREQUENCY DISTRIBUTION OF ABO, RH BLOOD GROUPS AND BLOOD GENOTYPES AMONG THE STUDENTS AND STAFF OF MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE ABIA STATE, NIGERIA.

ABSTRACT

Five hundred and sixty four students and some staff who come for medical examinations were randomly selected from the university in the university Health services department for ABO, RH blood groups and six haemoglobin genotype studies. Blood group O was the highest with percentage frequency of (63%) followed by group A (23.1%), B (11.7%) and the least percentage frequency was AB which (2.3%) the Rh D distribution also varies among the four ABO blood groups. O had the highest percentage of 60%, followed by B which was 23.3% and the least with A which was 16.7% and now for AB. Rh D positive was 94.7% and that of Rh D negative was 5.3%. When the students and staff were screened for haemoglobin genotypes, the percentage frequency for haemoglobin genotypes were HbAA, HbAS, HbSS, HbAC and HbSC were respectively.

Keywords. Blood group, Haemoglobin genotype, ABO, RH and Percentage frequency.
INTRODUCTION

Since landsteiner discovery in 1901 that human blood groups existed, a vast body of serological, genetic and biochemical data on red cell antigens has been accumulated. Discovery of the ABO system by landsteiner marked the beginning of safe blood transfusion. The ABO antigens although most importantly in relation to transfusion are also expressed on most endothelial and epithelial membranes and are important histocompatibility antigen (Eastlund, 1998). Transplantation of ABO incompatible solid organ increases the potential for hyperacute graft rejection. Major ABO incompatible stem cell transplants will provoke haemolysis unless the donation is depleted of red cells (Dacie et al., 2006).

There are four main blood groups; A, B, AB and O. In the British Caucasian population, the frequency of group A is 42%, AB 9%, AB 3% and 0 46%, but there is racial variation in these frequencies (Mourant et al., 1976). The epitopes of ABO antigens are determined by carbohydrates which are linked either to polypeptide or to liquids.

The expression of ABO antigens is controlled by three separate genetic loci. ABO located on chromosome 9 x FUT₁ (H) and FUT₂ (Se), Both of which are located on chromosome 19. Each gene codes for different enzymes (glycosyltransferase) which attach specific monosaccharides onto precursor disaccharide chains.

It is likely that the O and B genes arose by mutation of the A gene. The O gene does not encode for the production of a function of a functional enzymes, the B gene differs from A by consistent nucleotide substitution (Yamamoto, 1995).

ABO antibodies in the presence of corresponding antigens, appear during the first few months after birth, probably as a result of exposure to ABH antigen like substances in the diet or the environment (they are naturally occurring). The antibodies are potential cause of dangerous haemolytic transfusion reactions if transfusions are giving without regard ABO compatibility. Hyper Immune anti-Aanti-B occur less frequency, usually in response to transfusion or pregnancy, but they may also be formed following the injection of some toxoids and vaccines. Hyperimmune IgG, anti-A and for anti-B from group O or group A₂ mothers may cross the placenta and cause haemolytic disease of the newborn (HDN). Group O donors should always be screened for hyperimmune anti – A and anti – B antibodies (Dacie et al., 2006).

Rh SYSTEM

The Rh system was so named because the original antibody that was raised by injecting red cells of rhesus monkey into rabbits and guinea pigs reacted with most human red cells. Although the original antibody was subsequently shown to be different from anti D, the Rh terminology has been retained for the human blood group system. The clinical important of this system is that individuals who are D negative are often stimulated to make anti-D if transfused with D positive blood or in the case of pregnant woman.

It is the second most clinical important blood group system after ABO blood group. It is a very complex system. At its simplest, it is convenient to classify individuals as D positive or D negative depending on the presence of the D antigen. It can cause haemolytic disease of newborn HDN by secondly immune response due to sensitization by fetal D positive red cells through placenta and the antibodies haemolysing the fetal cells. It can cause equally transfusion reaction if there is incompatible Rh D negative patient is being transfused with Rh D positive whole blood.
Rh-D distribution also varies worldwide. Rh-D negative blood group is documented as 5.5% in south India, Nigeria 17.8%, Lahore, 7.3%, Rawalpindi, 7.7, Nairobi 5% (Mwangi 1999 Omatoele, 1999, Bhatti and Amin, 1996).

Sickle cell haemoglobin Hbss differs from normal adults haemoglobin (Hb AA) because there is a replacement of glutamic acid by valine at positive of beta-globin chain molecule. When the availability of the oxygen is reduced the red cells sickle, form polymers, become rigid and can vasodilate resulting to anaemia of the brain causing stroke. The patient is highly anaemic for the homozygosis but the heterozygose is slightly anaemic and has selective resistance advantage to malaria than HbAA and HbSS patients. There are several common forms of sickle cell traits, SC, heterozygote of HbA and HbC and S-beta thalassaemia. The clinical course of sickle cell disease is extremely variable (plant et al., 1991).

MATERIAL AND METHOD

A total of 564 students were selected using simple random sampling techniques among the students and staff of Micheal Okpara University of Agriculture Umudike, Abia state, Nigeria during the course of their medical examination. Blood samples were collected by venepuncture method and transferred into the prepared EDTA anticoagulant bottles.

ABO and Rh Blood Group Test

The samples were grouped with cell grouping using anti-sera obtained from Halena Laboratories Beaumaout, Texe. The grouping was done on a clean slide where 3 drops of blood for each sample with the anti sera and mixed and observed for agglutination.

Blood Genotype Test

For the study of the blood genotype, cellulose acetate electrophoresis technique at alkaline plot was used. A small quantity of venous blood was placed on the slide and mixed with 3 drops of clean water to lyse. With the aid of an applicator, the haemolysate was placed on the cellulose acetate paper. Electrophoresis in Tri-EDTA buffer solution was 15 – 20 minutes at 230V. Haemolysates of blood samples of known genotypes were run as control with the test sample.

RESULTS

Five hundred and sixty four of the students and staff were randomly selected from Michael Okpara University of Agriculture, Umudike and tested. This consisted of 286 males and 278 females between the ages of 16 and 66. The frequency distribution of the blood groups A, B, AB and O is shown in table 1. There was significant difference in the distribution of blood group O and A but, there was no significant difference in groups B and AB.

The frequencies of RhD groups are shown in Table 2. The Rh D+ and RhD – distribution varies among the four groups ABO blood groups. The percentage of the various haemoglobin genotype obtained in this study are shown in Table 3, The percentage varied significantly the highest percentage was found with genotype HbAA (77.7%), HbAS (16.1%), HbSS(0.5%), HbCC (0.2%), HbAC(0.2%) and to HbSC (0%). Table 3 indicates the frequency distribution of haemoglobin genotypes.
Table I: ABO Blood Group And Rh –Blood Group

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>A-B</th>
<th>O</th>
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<tbody>
<tr>
<td>Male</td>
<td>58(10.3%)</td>
<td>33(5.9%)</td>
<td>7(1.2%)</td>
<td>189(33.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>72(12.8%)</td>
<td>32(5.7%)</td>
<td>7(1.2%)</td>
<td>167(29.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>130(23.1%)</td>
<td>65(11.7%)</td>
<td>13(2.3%)</td>
<td>356(63%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rh – D</th>
<th>Blood group</th>
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<tbody>
<tr>
<td>Rh – D+</td>
<td>Rh –D+</td>
</tr>
<tr>
<td>534 (94.7)</td>
<td>30 (5.3%)</td>
</tr>
</tbody>
</table>

Table 2: The frequencies of RhD groups

Rh – D+ = Rh – D positive
Rh – D- = Rh – D negative

<table>
<thead>
<tr>
<th>Sex</th>
<th>Hb AA</th>
<th>Hb AS</th>
<th>Hb SS</th>
<th>Hb AC</th>
<th>Hb SC</th>
<th>Hb CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>212 (37.6%)</td>
<td>79 (14%)</td>
<td>1 (0.2%)</td>
<td>1 (0.2%)</td>
<td>0 (0%)</td>
<td>1 (0.2%)</td>
</tr>
<tr>
<td>Female</td>
<td>226 (40.1%)</td>
<td>42 (7.4%)</td>
<td>2 (0.4%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>438 (77.6%)</td>
<td>121 (21.4%)</td>
<td>3 (0.6%)</td>
<td>1 (0.2%)</td>
<td>0 (0%)</td>
<td>1 (0.2%)</td>
</tr>
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</table>

Table 3: Haemoglobin Genotypes

DISCUSSION

Blood group normally varies from population to population as opined by Adeyemo and Soboyejo, 2006). In the caucasians in the United State, the frequency distribution is O, 47%, A, 41%, B,9% and AB 3% and for the blacks in the United states, the distribution is type O, 46%, type A, 27%, type B, 2% and AB% (Seeley et al., 1998).

Rh –D distribution also varied according the results. Rh – D Positive was 94.7% and Rh – D – negative was 5.3%.

The percentage frequency distribution of the 564 of the students and the staff of the University Screened for haemoglobin genotypes, the frequencies for AA, Hb AS, Hb SS, Hb AC, Hb AC, Hb SC were 77.6%, 21.4%, 0.6%, 0.2%, 0%, 0.2% respectively. The ratio of Hb AA to AS was 4:1, Hb AA to Hb SS, 46:1, the ratio of Hb AS to Hb CC, 121:1. The high frequency of Hb AA and Hb AS is in line with the work of Nwafor and Banigo (2001), for Hb AA is 55 -75%, Hb AS 20 -30% in Nigeria as contained in Adeyemo and Soboyejo (2006).

The knowledge of the above study to the populace and to those in authority for genetic counselling, medical diagnosis, for research and general well being of the citizens. Blood group, genotypes should be made compulsory as criteria for registration in Nigeria school from primary school upwards.
and in employment places. As the level of HbSS is low which may not be completely eliminated because of endemicity of malaria, those with HbAS should make wise choice in the course of choice of life partner in marriage.

REFERENCES