

The distribution of the ABO and Rhesus blood groups among an indigenous ethnic group in Nigeria

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Abstract

Background: In this study, the authors set out to find out the ABO-RhD blood group distribution among Idoma, an indigenous ethnic group in the middle belt of Nigeria in view of the paucity of such information about the ethnic group. **Methodology:** 2,000 blood donor volunteers were randomly selected from the Idoma speaking towns of Otukpo, Otukpa and Okpoga, comprising of 1,253 males and 747 females aged between 20 and 50 years. Commercial anti-A, B, H and RhD (Class technology, UK[®]) antisera were used in the study after certification by the head technologists in the haematology sections of the three general hospitals. The slide method was used, with both forward and reverse groupings carried out in determining the ABO-RhD blood groups in the subjects.

Results: Of the ABO blood group system, group O has remained the most predominant group at 58.4% while group AB remains the least distributed at a frequency of 4.7%. Similarly, in the RhD blood group, 96.5% of the study population were RhD +ve as compared to 2.5% that were RhD -ve.

Conclusion: O+ve and AB-ve remains the most and least predominant blood groups respectively among the Idoma ethnic group in Nigeria as seen in other parts of Nigeria and Africa at large.

Keywords: Blood groups, ABO and Rh, Idoma, Nigeria

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Introduction

The ABO and Rhesus blood group have been known to have medical and haematological importance in transfusion medicine, genetics, medical jurisprudence, infertility problems, anthropology, haemolytic disease of the newborn (HDN), organ transplantation and oncology¹. These systems have also been known to be associated with disease conditions such as duodenal ulcer², diabetes mellitus³, urinary tract infection⁴ and Rh and ABO incompatibilities of newborn⁵. The distribution of these two blood groups has been repeatedly investigated in various populations all over the world during the last several decades⁵ and their frequencies exhibited considerable variation in different geographic locations, reflecting the underlying genetic and ethnic diversity of human populations⁶. The ABO blood group system is widely credited to have been discovered by the Austrian scientist Karl Landsteiner, who found three different blood types A, B and O in

1900 based on the presence or absence of the A or B antigen on the surface of red blood cells (RBCs). This discovery served the beginning of blood banking and transfusion medicine⁷. The fourth group type AB was later described by Alfred von Decastello and Adriano Sturli⁸ in 1902. In the subsequent years thereafter, several works were done by other researchers to elucidate how the alleles were inherited by an individual. In 1940, Landsteiner⁷ described in full the Rhesus system as being an essential component of the ABO blood group system.

The ABO blood types are also present in some other animals, for example apes, chimpanzees, bonobos and gorillas with the antigens inherited *in-utero* in the humans from the sixth month and the antibodies appearing usually in the first year of life by sensitization to environmental substances such as food, bacteria, and viruses⁹. There are six common alleles of the ABO gene that produce one's blood type: A1, A2, B1, O1, O1v and O2^{10,11}.

While the distribution of the ABO and Rh blood groups worldwide¹² and Nigeria in particular¹³ have been documented, data indicating such distribution among the indigenous ethnic groups of north central Nigeria is scarce. The study was therefore, designed to determine the distribution of ABO and Rh blood group among the Idoma ethnic group of north central Nigeria. It is hoped that findings shall be of immense benefit in the suitability and operability of sectoral

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blood bank services, as well as contributing to a pool of knowledge about the ethnic group in general.

Materials and Methods

Study location

The Idoma ethnic tribe whose main occupation is farming, is located in the north central zone of Nigeria with a population of about 3,000,000, occupying the area of land located within the broad valley of the Benue river and the Cross River basin; the main thrust being a contiguous belt of territory stretching from the Southern banks of the river Benue to the Northern fringes of Igboland. This territory lies within Latitude 6°North and Longitude 80°East and covers a total land area of approximately 5,955 square kilometres¹⁴.

Study design

This cross sectional descriptive study involved healthy blood donor volunteers of Idoma extraction who presented at the general hospitals in Otukpo, Otukpa and Okpoga between June and October 2010 being the major hospitals in the Idoma ethnic region.

Determination of ABO blood groups

Venepuncture was performed using the antecubital vein of each donor. Using a 21G hypodermic needle, 2 ml of blood was collected into a vacutainer® (Becton, Dickinson (BD), Oxford, England) tube containing ethylene diamine tetra acetic acid (EDTA).

ABO and Rh blood grouping was done by using commercially available anti-sera A, B, AB, H and RhD (Class technology, UK®) and validated by the technologists heading the haematology section of the three hospitals. Blood samples were prepared from the pooled blood units. For determination of ABO blood groups, the slide method was used and both forward and reverse groupings were carried out. One drop of anti-B serum was placed on the left side of the glass slide and one drop of anti-A serum on the right side. One drop of subjects' unknown cell suspension was mixed with each of these antisera and the slide was rocked gently for 3 to 5 minutes. The drops were shielded with cover slips to facilitate examination under light microscopy. The presence of agglutination observed within 2 to 5 minutes, showed the presence of the corresponding antigen to the given antisera. Thus, blood sample agglutination to antisera A indicates that the RBCs in the blood sample bear agglutinogen A and hence, the blood sample is group A. Similarly, antisera B will produce agglutination with B blood group sample while a blood sample that agglutinates both antisera A and B belong to blood group AB. In the absence of any agglutination to both antisera, such blood sample is group O.

Determination of Rhesus blood groups

For typing of Rh blood grouping, a drop of sample

blood was mixed with one drop of anti-D antisera on the slide and rocked gently for 3 to 5 minutes. Only anti-D was used as it was the most immunogenic. The drop was covered with cover slips and viewed under light microscope. The results were taken as Rh positive (+ve) if agglutination occurred because anti-D reagent agglutinates D antigen-bearing RBCs.

The data were double entered and validated. All statistical analyses were done using SPSS Software (version 19).

Ethical consideration

Ethical approval for the study was given by the management of the respective hospitals as there were no ethics committee as at the time of the study. Verbal consent was obtained from the management of the three general hospitals as well as the clients regarding the study.

Results

Specimens from 2000 blood donor volunteers made up of 1,253 males (62.6%) and 747 females (37.4%) aged 20 to 50 years of Idoma extraction were randomly selected from the general hospitals of three Idoma speaking towns of Otukpo, Otukpa and Okpoga for the study and were tested for ABO and Rh blood groups.

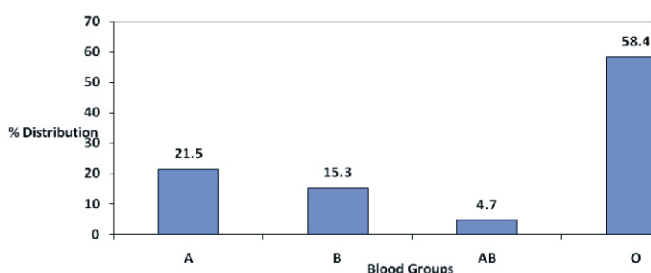


Figure 1. Frequency of ABO blood groups among indigenes of Idoma

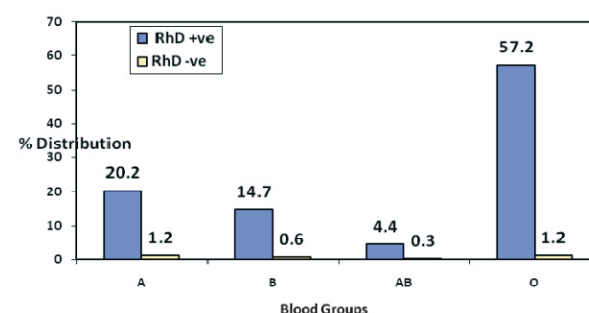


Figure 2. Frequency of Rhesus blood groups among indigenes of Idoma

The ABO blood group distribution frequency is shown in Figure 1. Blood group O had the highest frequency of distribution at 58.5% (n=1,169) followed by blood group A at 21.5% (n=430), blood group B at 15.3% (n=307) and blood group AB at 4.7% (n=94). The Rh blood group distribution shows that Rh D positivity was 96.6% (n= 1,931) while negative results accounted

for 3.4% (n=69) among the study population.

The distribution of ABO-Rh D blood group among the study population is shown in Figure 2. The pattern of presentation is similar to that of the ABO blood group with blood group O+ve having the highest frequency of 57.2% (n=1,144); followed by A+ve with a frequency of 20.2% (n=405), then B+ve and AB+ve with frequencies of 14.7% (n=294) and 4.4% (n=88 respectively). On the other hand, O-ve and A-ve blood groups have equal distribution frequency of 1.3% (n=25) each while blood groups B-ve and AB-ve have frequencies of 0.6% (n=13) and 0.3% (n=6) respectively.

Discussion

There exists a worldwide variation in distribution of ABO and Rh blood groups. In our study, ABO blood group O was found with the highest distribution frequency of 58.5% while group AB had the lowest frequency of 4.7%. Blood groups A and B had the distributions of 21.5% and 15.3% respectively. Similar distribution pattern of ABO blood groups had been reported in studies from Lagos, south west Nigeria, Kenya, Egypt, Jordan, and Eastern region of Saudi Arabia^{8,13,15}. Blood group B has its highest frequency in Northern India and neighbouring Central Asia, and its incidence diminishes both towards the west and the east, falling to single digit percentages in Spain^{16,17} and is believed to have been entirely absent among Native American and Australian Aboriginal populations prior to the arrival of Europeans in those areas¹⁷. Blood group A has a high frequency of distribution in Europe, especially in Scandinavia and Central Europe, although its highest frequencies occur in some Australian Aborigine populations and the Blackfoot Indians of Montana¹⁸. This may be attributed to their different ethnic background, besides sampling error, and natural selection.

In general, Rh positive individuals in this study make up 96.6% while the negative individuals are just 2.4% of the study population. This is similar in presentation as those of other researchers^{19,20}. An analysis of the Rh +ve group distribution among the ABO blood group shows that blood group O+ve ranks highest with a distribution of 57.2% while AB+ve ranks lowest at 14.7%, a pattern closely correlated to the ABO distribution among the study population. Aside the similar observed pattern of ABO and Rh distribution in other parts of Nigeria, similar pattern of distribution have been documented among the Arabs^{8,21,22}, in Southern India²³ and Kenya¹⁵.

Being a hospital based study posed some degree of limitation as a community survey may have been more inclusive population wise. However, the results of our study may form the basis for studying other ethnic minorities. Additionally, we could not analyze our data by sex. This may have implications for haemolytic

disease of the newborn.

From this study, inference can be made that, like blood distribution pattern in most African population, blood group O+ve is the most abundant while AB-ve is the least abundant blood groups among the Idoma ethnic group in Nigeria. This information could be of immense help in the citing and stocking of blood bank centres in this area as well as providing useful resources to researchers undertaking demographic and population studies in this area and Nigeria at large.

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