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DETERMINATION OF HIV INFECTION SUSCEPTIBILITY AMONG ABO AND RHESUS BLOOD GROUPS IN CALABAR MUNICIPALITY, CRS, NIGERIA.

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Abstract

This study aims to verify the susceptibility of ABO and Rhesus blood groups to HIV/AIDS infection in Calabar Municipality, CRS, Nigeria. The susceptibility levels of ABO and Rhesus blood groups to HIV/AIDS infection was investigated in 300 confirmed HIV/AIDS patients in Calabar, using the HIV/AIDS Unit of the nGeneral Hospital Calabar, Cross River State, Nigeria. Venous blood samples were collected with the help of skilled Laboratory Scientists, from the confirmed HIV/AIDS patients into sterilized, labeled blood specimen bottles and serological analyses. ABO and Rhesus blood grouping were performed simultaneously with reagents (anti-A, anti-B, anti-AB, and anti-D) using agglutination on tile method. The result of Rhesus blood determination was confirmed using washing, sensitizing with bovine albumin, rewashing and adding human globulin and then observe for agglutination as positive result. The study has revealed the different levels of association of ABO and rhesus blood groups with HIV/AIDS infection. It was also found that blood group O was generally more frequent among the participants in this study. There were more of blood group O victims of HIV/AIDS (122/40%) of the 300 participants and AB blood group had least number of HIV/AIDS patients (43/14%), thus confirming the reports of some earlier studies. Similarly, Rhesus negative (Rh-) blood group tended to show high susceptibility to HIV/AIDS (264/88%) than Rhesus positive (Rh+) blood group (36/12%). Statistical analysis using Pearson correlation test to verify the relationship between ABO and rhesus blood groups with HIV/AIDS proved significant at $P < 0.05$.

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INTRODUCTION

Human immmunodeficiency virus (HIV) is the virus that causes Acquired immunodeficiency syndrome (AIDS) which destoys the human immune system and makes it easy for other infections to threaten the lives of patients. There are many ways AIDS can be transmitted, and they include contact with blood, breast milk, semen, vaginal fluid of an infected persons, etc.

Since 1981, when this HIV/AIDS was first described, has spread widely like forest fire and has alarmingly caused deaths of over 25 million people worldwide (13). WHO (14) gave a global estimate of about 34.0 million people who were living with HIV as at the end of 2011, pointing out that Sub-Saharan Africa ranks highest as the most severely affected such that nearly 1 in every 20 adults (4.9%) live with HIV. It has been reported that even though HIV is the virus that causes AIDS, but not everyone infected with HIV has AIDS the reason being that AIDS is the result of progression of HIV infection. This means that any body infected with HIV, can still transmit the virus to another person irrespective of how healthy he or she may appear to be.

Acquisition of immunodeficiency syndrome through blood transmission is just like most other blood infections enhanced by surface antigens of the erythrocytes of the ABO and rhesus blood group systems particularly because they serve as receptors for disease-causing agents. It is therefore for this major reason that verifying the relationship between ABO and rhesus blood groups and their susceptibility to HIV infection has become eminent (1).

ABO blood group system was the first human blood system discovered by Landsteiner in 1900 during which it was found that blood has two major antigens which collaborate to determine the

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four known blood group types, designated as Blood Group A for those that possess A antigen, Blood Group B for those having B antigen, Blood Group AB for those having both A and B antigens in their blood, while those whose blood is devoid of any antigen (i.e., no A, no B) are said to belong to Blood Group O. Rhesus Blood is another blood group system which was discovered later and is also said to play a crucial role in blood transfusion. In this system, 3 dominant and 3 recessive antigens combined to form eight different types of rhesus blood groups. The dominant antigens were denoted by C, D and E, while the recessive types are correspondingly denoted with small letter c, b and e. In this case, the presence of the dominant antigens in the blood of an individual makes it Rhesus positive (+ve) and their absence makes an individual Rhesus negative (-ve). This implies that the presence of dominant D antigen makes the blood sample Rhesus (D) positive, etc.

Several earlier studies in different parts ofthe world have been able to establish association of blood group system with different diseases (4,8,7,9) at different levels. Pulmonary tuberculosis was reported in the Far East to have been more prevalent among ABO blood groups system (Jain, 1970), while in Britain stomach ulcer was found to have a higher prevalence among blood group A than the rest blood groups. Previous studies had also reported that blood group O individuals are more susceptible to Peptic Ulcer disease than other blood groups perhaps because of insufficient N-acetyl-glucosamine which is said to be very necessary for deveopment of the mucosa lining of their alimentary canal. Similarly, studies carried out in India revealed that the inheritance of blood groups and the consequent inheritance of certain immunological features may influence the development of the HIV infection (3, 6, 5). In another studies too, it was found that patients of blood group O who are rhesus positive tended to be more prone to HIV infection

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than other groups. However, scientific evidence has proved that the degree of natural antibodies resistant to viral antigens depends on the individual's blood group, which could then be attributed to be the main cause of natural resistance towards their infection.

Materials and Methods

The study area.

The study area was Calabar Metropolis, the Capital of Cross River State. Calabar situated is between latitude 4º27' and 6º56' North, and longitudes 7º51` and 9º29` East. It is bounded in the North by Akamkpa Local Government Area, Odukpani Local Government Area in the West, Akpabuyo Local Government Area in the East and the Atlantic Ocean forms the Southern limits of Calabar. Calabar Metropolis has 2 Local Government areas, namely; Calabar South and Calabar Municipality. It has an area of 406 km^2 and a population of 371,022 in the 2006 census. Calabar is a large metropolitant city with several towns like Akim, Big Quo Town, Duke Town, Henshaw Town, Ikot Ishie, Ikot Ansa, Ekorinim, Kasuk, Ikot Effanga Mkpa, Ikot Omin, Obutong, etc. The city is watered by the Calabar and Great Kwa rivers and creeks of the Cross River (from its inland delta).

The two major seasons (i.e., wet or rainy and dry) which characterize Nigeria also apply in Calabar Metropolis. The wet season generally begins in March and ends in October. The annual rainfall varies from about 60 inches in the North to 150 inches on the coast. Temperature is fairly constant through the year varying according to season between 94º and 7ºF [*www.wikipedia.com*]. According to history, the quas were the original inhabitants of Calabar before the arrival of other ethnic groups. Today, Calabar Metropolis is a cosmopolitan city embracing virtually all the ethnic groups in Nigeria and therefore presents a good case study.

The indigenes are fish farmers, traders and are also involved in wild games. The riverine

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communities are reputed for sea foods such as fish, prawns and bivalves. Food crops include yam, cassava, cocoyam, plantain, maize while economic crops include; oil palm produce, rubber, cocoa and kola. Vegetables cultivated and consumed in Calabar include fluted pumpkin, water leaf, okro, afang (or "okazi" in Igbo, "okana" in Yakurr vernacular), atama, editan, inyangafia and bitter leaf, scent leaf, hot leaf, etc. They are mainly included in soups or sauces, which are used in consumption of main meals that in majority of households are cassava-based.

Study population

300 individuals were used as study subjects in this research and were recruited from two categories of people; the confirmed HIV/AIDS patients who come to collect their routine retroviral drugs, and those who were coming to check their HIV/AIDS status at the HIV/AIDS Department of the General Hospital, Calabar, Cross River State, Nigeria. Blood samples collection from the confirmed HIV/AIDS patients as was normally done for their routine checkup was carried out. Blood samples collected from patients whose ages fell outside the prescribed limits (15–65 years) and whose body weight was less or equal to 40 kg, prenatal and postnatal and menstruating women were not used for this study. However, all the participants were assured that the data gathered from the examination of their blood samples would be handled with maximum confidentiality. The study was conducted in 2017.

Ethical Approval

Ethical approval was sought in writing and obtained accordingly from the Ethical Approval Committee of the Cross River State Ministry of Health before embarking on this research.

Blood sample collection

Venous blood samples used for this study were collected with the help of skilled laboratory Scientists attached to HIV/AIDS Department of the General Hospital, Calabar, into sterilized,

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labeled/numbered blood specimen bottles and conveyed immediately to the laboratory where serological analyses were carried out. The blood collection, screening and grouping exercise lasted ten (10) days as they were collected in batches of 30 participants daily for purpose of accuracy of results.

Screening of the blood samples for ABO and Rhesus blood grouping

Aside from the confirmed HIV/AIDS patients, the blood samples collected from other participants were screened for HIV/AIDS using the procedure described by Cheesbrough, (2006). Some quantity of the venous blood collected from participants was put into centrifuge bottles and spun in a centrifuge at 100 revolution per minute (rpm) for 5 minutes. Using a pipette, 3 drops of the supernatant plasma from the centrifuged blood were added onto the absorbent part of the HIV determinant strip and its migration along the strip was observed. Appearance of a single line on both the test and control regions, respectively, indicates positive result while appearance of a single line only on the control region indicates negative result Confirmation of positive result was done using RVST cassette. Here, the test was repeated with the unigold and stat-pak cassette each of which was an accompanying buffer. In this case, 2 drops of the buffer and a drop of the plasma were placed on the cassette via the space provided for sample, and result is read for positivity or negativity.

In order to ensure that the HIV determination strips and cassettes were functioning properly, a control test was carried out using a HIV positive blood to test on the kits for a positive result. Positive result indicated that the kits were functioning properly and the results gotten were not false negative.

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ABO and Rhesus blood grouping were performed simultaneously using reagents (anti-A, anti-B, anti-AB, and anti-D) and procedure described by Cheesbrough (12). Four drops of each blood sample were placed on a clean tile and to each was added a drop of respective blood grouping sera and then mixed thoroughly using applicator stick. Any blood sample mixed with a particular grouping sera that showed agglutination is an indication of positivity meaning that the blood sample belong to that particular blood group.

Similarly, blood samples were placed on a clean tile, a drop of Antisera-D was added to each and stirred with applicator stick and then observed. Positive result was indicated by occurrence of agglutination on any mixture, hence, Rhesus Positive (Rh+). A negative result was further investigated to ensure a true rhesus profile. The rhesus factor results so obtained were subjected to confirmation by washing blood sample several times until the supernatant was clear. Bovine albumin was then added to sensitize the cells. The mixture was incubated at 37^{o}C for 1hour. After incubation the mixture was washed several times again until a clear supernatant was obtained after which a drop of it was placed on a sterile clean white tile and a drop of Anti-human globulin was added. Again agglutination indicated Positive Rhesus Factor (Rf+) while non-agglutination indicates Negative Rhesus Factor (Rf-).

The HIV/AIDS results were then matched with the ABO and Rhesus blood groups to establish the distribution of the HIV/AIDS patients among the ABO and Rhesus blood groups as shown in Table 1.

Statistical analysis

The data obtained in the study were subjected to Pearson correlation test to ascertain the level of association between HIV/AIDS infection and ABO and Rhesus blood groups at $P < 0.05$.

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RESULTS

The distribution of HIV/AIDS disease among the ABO and Rhesus blood groups of participants showed that of the 300 patients of this disease, 74/24.7% were of blood group A, 61/20.3% belonged to B group while 43/14.3% and 122/40.7% were patients belonging blood groups AB and O, respectively.

Table 1: **Distribution of HIV/AIDS disease among ABO and Rhesus blood groups in Calabar Metropolis**

Blood Group A		Blood Group B		Blood Group AB		Blood Group O		Total
74(24.7%)		61(20.3%)		43(14.3%)		122(40.75)		300(100%)
Rh +ve	Rh -ve	Rh +ve	Rh –ve	Rh +ve	Rh –ve	Rh +ve	Rh -ve	Rh+ve & Rh-ve
7(9.5%)	67(90.5%)	5(8.2%)	56(91.8%)	6(13.9%)	37(86.1%)	18(14.8%)	104(85.3%)	36(12%) & 264(88%)

Key: (+) means Rhesus positive, and (-) means Rhesus negative

The result also revealed that 36(12%) patients were rhesus positive while the rest 264(88%) were rhesus negative. The distribution of the HIV/AIDS among rhesus blood groups showed that of the 74(24.7%) patients of ABO blood group A, only 7(6.5%) were A positive (A^+) and 67 (90.5%) were A negative (A^-) blood group. Similarly, 5(8.2%) HIV/AIDS patients of blood group B were B^+ while 56(91.8%) were B^- rhesus blood group. Of the AB blood group patients, 6(13.9%) were AB^+ whereas 37(86.5%) belonged to rhesus AB^- blood group. Among the blood HIV/AIDS patients of O blood group, 18 (14.7%) were O^+ and the remaining 104 (85.3%) were rhesus O^- group (Table 1).

It was also found that 168(56%) of the HIV/AIDS participants in this study were females and 132(44%) were males, while in terms of age, the oldest patient was 61 years and the youngest patient was 16 years old.

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DISCUSSION

The different degrees of susceptibility of blood groups (ABO and Rhesus) to different types of blood-borne disease have long been a global issue most especially in consideration of blood transfusion-related consequences of infected blood. This study has revealed the different levels of association of ABO and rhesus blood groups with HIV/AIDS infection. It was found that blood group O was generally more frequent among the participants in this study than other blood groups and this agreed with the earlier report of a study by Maatoghi *et al*., (9) on ethnicity-related prevalence of blood groups in which they found that blood group O was most prevalent while AB blood had the lowest prevalence. The result also showed that there were more of blood group O victims of HIV/AIDS compared to others, thus confirming the reports of earlier studies by Sayal *et al* ., (3), Abdulazeez *et al*., (2), Fatemeh and Aliakbar (10) and Carine *et al*., (1) undertaken in different parts of the globe, in which they found that Blood group O was more susceptible to HIV/AIDS than other blood groups. Also observed in this study is the fact that rhesus negativity generally recorded highest HIV/AIDS patients of 224(88%) and only 36(12%) rhesus positive blood individuals had HIV/AIDS disease. Even in the different ABO blood groups rhesus negative is tended to be more prevalent among HIV/AIDS infected individuals. From the result shown in table 1, rhesus positivity and negativity distribution has indicated that in blood group A, rhesus A negative (A^-) blood had 67(90.5%) HIV/AIDS patients, in B group, B positive (B^-) accounted for 56(91.8%). Similarly, in AB group, 37(86.5%) HIV/AIDS were AB negative (AB^-) while in blood group O, 104(85.3%) O negative (O^-). This finding is in agreement with the report of the previous study by Maatughi *et al*., (9). It was only AB blood group which showed the least number of HIV/AIDS patients in this study, meaning that individuals belonging to AB blood group are less susceptible to HIVAIDS in comparison with

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others. This also disagreed with the finding of Abdulazeez *et al*., (2) who reported that blood group AB individuals are more prone to HIV.

The observed high prevalence of blood group O and rhesus O^- negative contradicts with the reports of Sayal *et al*., (3) and Ravizz *et al*., (5) who in their respective studies had reported that patients with the blood group O and rhesus positive were rather most susceptible to HIV infection.

Blood group inheritance and natural defense mechanisms against infections has long been suspected to have some genetic link, which has thus accorded the different blood groups A, B, AB, and O different levels of natural antibodies (11). This therefore may be the reason why those who belonged to blood group B have a very high degree of natural resistance against HIV/AIDS infection while those of O blood group tend to have very low level of such natural resistance. Invariably Rh positive individuals have higher resistance to HIV/AIDS thereby making them to record lower incidence of HIV/AIDS infection than the Rh negative individuals.

Statistical analysis to verify the correlation of ABO and rhesus blood groups with HIV/AIDS proved significant at $P < 0.05$ probably reasons advanced above.

CONCLUSION

This study has proved that there is differential susceptibility of ABO and Rhesus blood groups to HIV/AIDS infection as a result of their inherited different levels of natural defense mechanisms.

RECOMMENDATIONS

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Having knowledge of ABO and Rhesus blood groups is necessary to enable an individual know his/her level of susceptibility to HIV/AIDS infection.

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