

## THE DISTRIBUTION OF ABO AND RHESUS D BLOOD GROUP ANTIGENS IN NEMBE COMMUNITY OF BAYELSA STATE

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### **ABSTRACT**

This study investigated the distribution of ABO and Rhesus D blood group antigens in Nembe community of Bayelsa State in Nigeria. A total of 204 students in a coeducational institution in Nembe community were used in this study. They were made up of 124 males and 80 females. 5.0mls of blood were collected from each of the patient by venepuncture and transferred into a bottle containing EDTA. Fresh red cell suspension and 20% suspension of known A, B and Rhesus D antigens were prepared. Tile agglutiaion technique was used in the determination of ABO and Rh.D grouping system. The results showed that for the distribution of ABO Groups in the studied population 66 (32.3%) of the males were group O which was the highest while 6(2.9%) of the males were AB which was the least. For the females 28(13.7%) were group O and the same number of females had group A also which was the highest while the least number of 2(0.9) females were group AB. None of the 123 males, 116(56.8%) were Rh.D positive while 8(3.9%) were Rh.D negative. And out of 90 females 74(36.2) were Rh.D positive while 6(2.9%) were Rh.D negative. The frequency distribution of Rh.D positive and Rh.D negative subjects in ABO blood groups in males, females and in the total subjects studied were assessed, the result showed that blood group O had the highest number and frequency of Rh.D positive and negative in all the above parameters assessed. On the basis of the findings the study

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therefore concludes that blood group "O" and Rh.D positive are the most common and prevalent blood group antigens in Nembe community of Bayelsa State.

**Keywords:** Antigens, ABO Rh.D, Distribution, Agglutination and Blood.

## INTRODUCTION

The human blood can be grouped according to some criteria. The criteria mostly used are according to the presence or absence of certain substances on the blood of the individual. These substances are called blood group antigens. They are known to be present on the surface of the red blood cells forming part of their cell membrane on the leucocytes and in the serum portion of blood (Garrison *et al*; 1976, Dali *et al*; 2011).

Antigens are substances that are capable of stimulating the production of antibodies under favourable condition (Anstee 2010). Blood group antigens therefore are the various antigens found on the blood that are used in blood grouping. Various blood groups exist: they include the ABO, Rhesus, Keel, Duffy, MNS, Lewis etc. (Austee 2010).

The importance of these antigen are mostly considered during blood transfusion. A blood antigen (mostly of the ABO system) has a corresponding antibody to the antigen it does not possess (Frances 2002). Reaction occurs when an antibody finds its corresponding antigen. Agglutination and lyzing of the red cell occurs. Of all the blood group antigens the Rhesus 'D' A and B are by far the most important (Frances 2002), Waseem *et al*; 2012) During pregnancy the blood of the mother and her unborn child most at times mixes together across the placenta. Antigen-anti body reaction occurs which can be dangerous to the unborn child

(Mollison *et al.*). The Rhesus 'D' antigen is very significant in this issue as antibodies produced from a Rhesus 'D' negative mother would cause the lysing of the red cells of a Rhesus 'D' Positive fetus. This leads to a disease condition known as hemolytic disease of the new born (HDN) (Alaine arruabaureu 1977).

The ABO blood group antigens are also found in some body secretions such as Saliva (Horby and Gytrup 1989). These antigens are also found in many parts of the body and are most concentrated in the upper intestinal tract (Race and Sagner 1996).

There are strong evidences that a lot of disease are associated with the various blood groups (Horhy and Gyltrup 1989). A study in Peru revealed that life threatening cholera is associated with blood group O (Platt *et al.*; 1985). Hyperthyroid disease is associated with blood group O. In their research work, pathirana *et al.*; (2005) discovered that individuals of group O are relatively resistant to several disease caused by *plasmodium falciparum* than individuals of group AB. Duodenal and stomach Ulcer is also strongly associated with individuals of blood group O (Jill 2003), cancer of the stomach is more common with individuals of group A than those of group O and B. Group A individual are also more prone to pernicious anaemia and diabetes mellitus (Harby *et al.*; 1989, Jassim 2012).

The frequency of ABO and Rh.D phenotypes varies in different populations throughout the world (Aild *et al.*; 1953). In the study carried out by Mollison *et al.*; (1993), the commonest group in the Australian Aborigines are group O and A. In Lapps and among the Europeans there is a higher frequency of group A. They also showed that blood group B is most predominant in African

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(Mollison *et al*; 1993). France (2002) gave the percentage distribution of whites in the United states as blood group O 46%, A 41%, B 9% and AB as 4%. That of the negroes (New Yorkers) is given as blood group O 44.2%, A 39.3% B 21.8% and AB as 3.7% (Frances 2002). In Saudi Arabia 52% of the individuals are of blood group O, 25% group A, 18% group B and group AB 5%. Mazban *et al*; (1998) gives the percentage frequency of Ahwaz (Iran) as group O being highest with 41.6%.

The population in Parkistan Asia has blood group B 32.4%, A 22.6%, O 30.5% and AB 8.6% (Rahman *et al*; 2004). In the British population group O occupies 46.7%, A 41.7%, B 8.6%, and AB 3.0% (Hoffbrand 1981). The African country of Kenya has a percentage distribution of blood group O as 47.4%, A 26.2%, B 22.0% and AB 4.4% (Lyko *et al*; 1992). The India population is dominated by blood group B (37.5%) (Talib 2000).

The European population is 95% Rh.D positive while 5% are Rh D negative (Mollison *et al*; 1993). The United States 85% of the population are Rh D positive while 15% are Rh D negative (Frances 2002). Marzban *et al*; give 90% Rh D positive and the remaining percentage as Rh D negative in Ahwaz region population. The study of Bashwari *et al* (2001) gives the Saudi Arabian population as being 93% Rh D positive. The Rh D negative frequencies vary from 20-40% in Basques to 0-1% in many Asian countries such as Japan and China (Mollison 1993). Talib (2000) gives the summary of Rh.D positive distribution as Asians 90-98%, Africans 94-95%, Napalese 99-100% and the Caucasians as 85%.

This study is therefore, aimed at investigating the distribution of ABO and Rhesus D blood group antigens in Nembe community of Bayelsa State in Nigeria.

## **MATERIALS AND METHODS**

### **Recruitment of Patients**

A total of two hundred and four (204) students in a coeducational institution in Nembe were used in this study. They were made up of one hundred and twenty four (124) males and eighty (80) females.

### **Collection of Samples**

5.0ml of blood were collected from each of the recruited patients using venepuncture technique and transferred into a bottle containing ethylenediamine tetra acetic acid (EDTA). This was gently rocked to ensure thorough mixing of the blood sample with the anticoagulant.

### **Preparation of fresh red cell suspension**

This was done using each of the samples to be grouped. Two ml of the samples were transferred from the EDTA bottle to a test tube. 3.0ml of normal saline solution was added to the tube, the contents mixed and centrifuged for 5 minutes. The supernatant was decanted and this was repeated three times.

20% suspension of known red cells containing the A, B, and Rhesus D antigen were prepared in the same way and used for the serum (reverse) grouping.

### **Procedures for ABO grouping**

Tile agglutination technique was used in this determination. Microtitre wells were numbered 1-6 and one volume each of anti-

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A, Anti-B and Anti AB were added to wells 1, 2 and 3 respectively, while one volume each of A Cells, B cells and control 1 (patient cells and serum) were added to wells no. 4,5 and 6 respectively.

To wells numbers 1-3 one volume of patients cells were added whereas in wells number 4 and 5 one volume of patients serum were added. One volume of low ionic strength solution (LISS) freshly prepared was added to each well. The contents were mixed with separate applicator sticks. The tiles were rocked for four minutes making sure that the contents were not dried. Agglutination was observed, recorded and interpreted.

The contents of wells 4 and 5 served as a check to the actual test carried out on wells 1 to 3, and this process is known as reverse grouping.

#### **Rhesus D grouping:**

Anti-D reagent and patient washed cells and serum were used. The procedure was the same as for the ABO grouping system except that only two wells were used. One well for the test while the other was used for the control. The result was interpreted as agglutination for Rh.D positive and no agglutination as Rh.D negative as in the ABO system.

## **RESULTS**

The investigation of the distribution of ABO blood groups in the population studied showed that for group O there were 66 males and 28 females (total 94). Group A had 26 males and 28 females (total 54); group B had 26 males and 22 females (total 48) while group AB had 6 males and 2 female (total 8). Group O had the highest percentage frequency of 32.3% for males and 13.7% in females making a total of 46%. This was closely followed by group A, males having 12.8% and females 13.8% making a total of 26.6%.

Males for group B was 12.7% and females 10.9% making a total of 23.6%. Group AB had the least percentage frequency with males having 2.9% and females 0.9% making a total of 3.8% (Table 1).

**Table 1: Table showing the distribution of number and percentage frequency of ABO blood groups in studied population.**

	A	% Freq	B	% Freq	AB	% Freq	O	% freq
Males	26	12.8	26	12.7	6	2.9	66	32.3
Females	28	13.7	22	10.7	2	0.9	28	13.7
Total	54	26.6	48	10.9	8	3.8	94	46

The distribution of the numbers and percentage frequency of rhesus 'D' groups in the studied population showed that 116 males were Rh D positive making a percentage of 56.8% while 74 females were Rh 'D' positive making 36.2%. The total frequency of Rh 'D' positive individuals were thus 190 making 93%. In the Rh 'D' negative category, 8 males were Rh 'D' negative which was 3.9% while 6 females were Rh 'D' negative which was 2.9% of the total population. In all 14 individuals were Rh 'D' negative making a total percentage of 6.8% (Table II).

**Table 2: Table showing the distribution of the number and Percentage frequency of Rh 'D' Blood Group in studied population**

	No of Rh.D +	% freq.	No of Rh.D (-)	% freq
Males	116	56.8	8	3.9
Females	74	36.2	6	2.9
Total	190	93	14	6.8

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The frequency distribution of Rh.'D' positive and Rh.'D' negative subjects in ABO blood groups in males showed that among group A, 26 males were Rh+ while none was Rh(-) making a frequency of 21% and 0% respectively. Group B males were made up of 22 Rh D + and 4 Rh D (-) making a frequency of 17.8% and 3.2% respectively. Among group AB males 4 were Rh D + while 2 were Rh D - being 3.2% and 1.6% respectively. Group O males were most prevalent being 64 Rh D + and 2 Rh d- making a percentage frequency of 51.6 and 1.6 of the total male population respectively.

Summarily the study showed that out of the 124 males subjects tested 116 were Rh D + making a percentage of 93.6% while 8 were Rh D- making 6.4% (Table III).

**Table 3: Table showing the number and Frequency distribution of Rh D + and Rh D- Subjects in ABO Blood Groups in Males**

Blood groups	No. of Rh D+	% Freq.	No. of Rh D-	% Freq.
A	26	21	-	-
B	22	17.8	4	3.2
AB	4	3.2	2	1.6
O	64	51	2	1.6
TOTAL	116	93.6	8	6.4

This study showed that out of the 80 female subjects tested 26 of them were of group A having the Rh.D+ antigen while 2 of group A female were Rh 'D'-. Their percentage frequency was 32.5 and 2.5 respectively. Group B females were 22 (27.7%), Rh.D+ while none in this blood group had the Rh D antigen. In blood group AB,2 females were of Rh.D positive with frequency of 2.5% while there was none that had Rh.D negative. In group O



females, 24 were Rh D+ making 30% of the population and 4 Rh D- making 5% of the population and 6 Rh D- making a 7.5% frequency. On the whole 74 female subjects were Rh D+ occupying 92.5% while 6 subjects were Rh D- making a total of 7.5% of the entire female subjects (Table 4).

**Table 4: Table showing the number and frequency distribution of Rh D+ and Rh D- subjects in ABO Blood Groups in Females**

Blood groups	No. of Rh D+	% Freq.	No. of Rh D-	% Freq.
A	26	32.5	2	2.5
B	22	27.5	-	-
AB	2	2.5	-	-
O	24	30	4	5
TOTAL	74	92.5	6	7.5

The frequency distribution of Rh D+ and Rh D- subjects in the ABO groups of both sexes showed that in the group A category 52 subjects were Rh D + occupying 25.5% of the total population while Rh D- subjects in that category were 2 making 1%. In group B subjects 44 were Rh D+ (21.5) while 4 were Rh D- (2%). In the AB blood group 6 subjects were Rh D+ (3%) while 2 were Rh 'D'- (1%). Group O had the highest number of subjects, 88 being Rh D+ (43.1%) while 6 were Rh D-(2.9%). Finally 190 of the total subjects tested were Rh D+ occupying a frequency of 93% while 14 subjects were Rh D- occupying 7% of the total population (Table 5).

**Table5: Table showing the number and percentage frequency distribution of Rh D+ and Rh D- Subjects in ABO blood groups of total population**

Blood groups	No. of Rh D+	% Freq.	No. of Rh D-	% Freq.
A	52	25.5	2	1
B	44	21.5	4	2
AB	6	2.9	2	1
O	88	43.1	6	2.9
TOTAL	190	93	14	6.9

## DISCUSSION

The ABO and Rhesus blood group systems are by far the most commonly utilized blood group systems in blood transfusion. (Frances *et al*; 2002). According to Boyd (1950) these systems also play an important role in transplantation, hereditary diseases, genetics and in the migration of races. The association of different blood groups with diseases is important as some of the blood groups are prone to developing certain diseases (Aird *et al*; 1953). The particular type of blood group a person inherits depends on the genes that encode for blood grouping system. Within this system the frequency of distribution of these genes varies and their phenotype can reveal important information, including forensic evidence (Mollison *et al*; 1993, Bener *et al*; 2012).

This study found that blood group O has a percentage frequency of 47%, blood group A 26.6%, blood group B 23.6% and blood group AB 4% (Table 1). This work is in conformity with the works of Gaether *et al*; (1994). Gaetner *et al*;(1994) in their study of the Nigerian population gave their findings as blood group O 48.9%, group A 24.43%, group B 23.83% and AB as 2.7%. Other of their study has blood group O as 46.6%, A 23.05% and group

AB as 4.4% when they studied the population of northern Nigerian. The agreement of this work with other works can be seen in the dominating nature of blood group O over other groups and blood group AB occupying only a small percentage of the total population. (Jaggi and Yadav 2014).

In the Rhesus D blood group system, this study also showed near conformity with other studies. This study gives Rh D+ individual as occupying as high as 93% while individuals with no Rh D antigen as 7%. These percentages are slightly lower in the Rh D+ finding of Gaetner 95% and slightly higher in the Rh D- category of 5% in Gaetner. These results follow the global trend of Rh D- individuals being significantly rarer than Rh D+ persons. On the basis of the above findings, this study concludes that blood group O and Rh.D positive individuals are commonly found in Nembe community than other blood group antigens.

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