



Prevalence of Rhesus D antigen among patients attending Wudil General Hospital Kano state, Nigeria

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ABSTRACT

The Rhesus blood group system is the second most important red blood cell antigen system after the ABO blood group system. The purpose of this study was to generate basic data on the prevalence of Rhesus D antigen among patients attending Wudil general hospital. haemagglutination method was used to determine the presence of Rhesus D antigen using commercially available Anti-sera D. Anti-sera A and B were also used to investigate the ABO blood type. 200 blood samples were collected and transferred into Ethylene diamine tetra acetic acid (EDTA) containers. The blood samples were then transported aseptically to the laboratory for analysis. A drop of blood from each EDTA container was placed on a clean white tile. A drop of monoclonal anti-D was also added to each drop of blood and mixed with the aid of the tip end of the pipette. Results were obtained after two minutes based on agglutination. It was discovered that Rhesus D positive was the most prevalent with a percentage frequency of 90.5% (181) and Rhesus D negative was the lowest with a percentage frequency of 9.5% (19). It was observed that Rhesus D positive was higher in males than females (51.5% and 39.0% respectively). Rhesus D negative was also relatively higher in males than in females (6.0% and 3.5% respectively). A prevalent pattern of (B Rh-D +> O Rh-D +> A Rh-D +> AB Rh-D +> B Rh-D -> A Rh-D -> AB Rh-D -> O Rh-D -) was discovered. This study will be useful in studying the susceptibility of diseases with regards to Rhesus factor and may generate a vital information for population genetics and anthropological studies.

Introduction


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One of the antigens on the surface of red blood cells, the Rhesus antigen (named because a related antigen was first discovered in Rhesus monkeys), was discovered by an Austrian Biologist, Karl Landsteiner and Weiner in 1940.

The Rh blood group is one of the most complex blood groups known in humans. From its discovery 60 years ago where it was named (in error) after the Rhesus monkey, it has become second in importance only to the ABO blood group in the field of transfusion medicine. It has remained of primary

importance in obstetrics, being the main cause of hemolytic disease of the newborn (HDN) (Dean, 2005).

The Rhesus (Rh) factor has more than 50 antigens (Makroo et al., 2014; Humayun 2015). The D antigen is the most significant of them. Two genes RHD and RHCE control the expression of D antigen (Flegel, 2007 as cited in Humayun 2015). These genes are found on chromosome one (1p34-p36) (Cartron, 1994; Humayun 2015). Rh D negative (Rh D-) persons do not have the antigen, but it is present in the case of Rh D positive (Rh D+) individuals (Colin, 1991 as cited in Humayun 2015). Individuals who have the D antigen on their red cells are known as Rhesus-positive (Rh+) (DD or Dd genotype) while those without antigen D (dd genotype) in their red blood cells are Rh- (Knowles and Poole, 2002).

People are positive if they have Rh-D antigen on the surface of their red cells and are Rh negative if they do not have this antigen. Rhesus incompatibility can pose a major problem in pregnancies when the mother is Rhesus negative and the fetus is Rhesus positive. If fetal blood leaks through the placenta and mixes with the mother's blood, the mother becomes sensitized to Rhesus antigen. The mother produces Rh antibodies that cross the placenta and cause agglutination and hemolysis of fetal red blood cells. This is called hemolytic disease of the newborn (HDN) and its severity may worsen in subsequent pregnancies if not properly managed (Dennis et al., 1998).

The study of the distribution of blood groups is important as it plays a vital role in genetics, blood transfusion, organ transplantation, genetic research, and human evolution (Harvey and David, 2005). The knowledge of the distribution of ABO and Rh (D) blood groups is essential for the effective management of a Blood Bank's inventory, whether it is in a smaller local transfusion center or a regional or national blood transfusion service. Blood Transfusion Service (BTS) is an integral part of the modern health care system without which efficient medical care is impossible. The main aim of a BTS is to provide effective blood and blood products, which should be as safe as possible, and adequate to meet the patient's needs (Kotwal et al., 2014).

All human populations share the same blood group systems; although they differ in the frequencies of specific types. The incidence of ABO and Rh groups varies markedly in different races, ethnic groups, and socio-economic groups in different parts of the world (Bethesda, 2005).

There is a dearth of research on the distribution of the Rhesus factor in the Wudil Local government

Area of Kano state – in fact, none has been published, if at least there is. This among other reasons stimulated the investigation of the frequency of rhesus D antigen among individuals attending Wudil General Hospital.

Materials and methods

Ethical Approval/Study Group

The research was approved by the Ethical Committee, Ministry of Health Kano State with approval number NHREC/17/03/2018. The study groups were donors attending Wudil General Hospital and were informed of the goal of the study and they agreed to participate.

Study area

The research was conducted at Wudil local government area of Kano state, which is located in the East Central Area of Kano State, and the central area of Kano Region between longitude 8°45'E, as well as between latitude 11°37'N and latitude 11°56'N. It shares its western boundary with Warawa LGA to the northwest and Dawakin Kudu LGA to the southwest. It is bounded to the south and southeast by Garko LGA and on the east by Albasu LGA (southeast), Gaya (east), and Ajingi, northeast, and north.

Sample collection

The research was carried out from October to January 2021 at Wudil General Hospital. A total of 200 blood samples were taken by professional medical laboratory technicians. Demographic features of the donors were recorded in a semi-structured questionnaire (which is meant to know the age, sex, and other details of the donors/patients). Venipuncture was employed to collect blood samples from the antecubital vein. Blood was transferred into an Ethylene diamine tetra acetic acid (EDTA) container in order to prevent the blood from coagulation. The blood samples were then transported aseptically to the laboratory for analysis.

Experimental procedure

The experimental procedure is similar to the one used by Hassan et al., (2005). However, the procedure was invented by Bhasin and Chahal in 1996. A drop of blood from each EDTA container was placed on a clean white tile. A drop of monoclonal anti-D was also added to each drop of blood and mixed with the aid of the tip end of the pipette. Results were obtained after two minutes

based on agglutination. Monoclonal reagents A and B were also used to assess the distribution ABO blood groups.

Statistical analysis

The chi-square test was used to detect differences in categorical variables (age groups, gender, and blood groups) with probability values (p-values) calculated at the 0.05 level of significance. Frequencies and percentages were calculated.

Results

Prevalence of Rh-D among the sample population

The population of this study consisted of 200 patients attending Wudil general hospital, out of which 113 were males and 87 were females.

Table 1 shows the prevalence of the Rh-D blood group among individuals attending Wudil General Hospital. It was discovered that Rhesus D positive was the most prevalent accounting for 181 (90.5%) and Rhesus D negative was 18 (9.5%).

Table 1. Distribution of Rhesus factor among donors attending Wudil General Hospital, Kano State in 2021.

Rhesus Type	Frequency (N = 200)	Percentage (%)
Rhesus positive	181	90.5%
Rhesus negative	19	9.5%

Distribution of Rh-D based on the gender of the sample population

The distribution of the Rhesus factor with respect to gender was depicted in **Table 2**. It was observed that Rhesus D positive was higher in Males than females (51.5% and 39.0% respectively), and Rhesus D negative was also relatively higher in males than in females (6.0% and 3.5% respectively).

Table 2. Distribution of Rhesus factor based on gender

Sex	Rhesus Positive	Rhesus Negative
Males	103 (51.5%)	12 (6.0%)
Females	78 (39.0%)	7 (3.5%)

The chi-square statistic is 0.275. The p-value is .599987 there is no significant difference in the prevalence of the Rhesus factor based on gender at $P < .05$.

Distribution of Rh-D based on age group

The distribution of Rh-D antigens based on age was presented in **Table 3**. It was discovered that the frequency of Rh-D positive was higher among those ages between 30 to 45 years (35%), However, Rh-D positive was lower among those ages 60 and above (2%). This was influenced by the higher number of patients among those ages 30-45 years in the study area.

Table 3. Distribution of Rhesus factor based on age class among individuals attending Wudil General Hospital, 2021.

Age Class	Rhesus Positive	Rhesus Negative
1-18 Years	31 (15.5%)	3 (1.5%)
19-29 Years	51 (25.5%)	6 (3%)
30-45 Years	70 (35%)	8 (4%)
40-60 Years	25 (12.5%)	2 (1%)
60 Years and above	4 (2%)	0 (0%)

Distribution of Rh-D based on the ABO blood group of the sample population

Table 4 shows the distribution of Rhesus D antigen based on the ABO blood group system. It was evident from the table that B RhD positive blood type was the blood type with the highest percentage frequency (39%; n=78), followed by O RhD positive (28.5%; n=57), A RhD positive (16%; n=32), AB RhD positive (7%; n=14), B RhD negative (4.5% n=9), A RhD negative (2.5%; n=5), AB RhD negative (1.5%; n=3), and O RhD negative (1%; n=2).

Table 4. Rhesus D antigen frequency based on ABO blood group system among patients attending Wudil General Hospital, 2021.

Rhesus D Type	ABO Blood Groups			
	A	B	C	D
Rh D Positive	32 (16%)	78 (39%)	14 (7%)	57 (28.5%)
Rh D Negative	5 (2.5%)	9 (4.5%)	3 (1.5%)	2 (1%)

The chi-square statistic is 4.6399. The p-value is 200143. At $p < .05$. A chi-square test of independence showed that there was no significant association between the ABO blood group and the Rhesus factor.

Discussion

The frequency of ABO and Rh blood groups may vary from population to population (Pramanik and Pramanik, 2000; Mwangni, 1999).

As per the findings of the current study, Rh-D positive blood group was the most predominant accounting for 90.5% and the rest 9.5% was Rh-D negative. This is relatively similar to the study of Akinnuga et al., (2011) done in Elele, Nigeria where

rhesus D-positive individuals constituted 91.7%. The finding was also in agreement with research done in the United States by Garratty et al., (2004) among different ethnic groups, where rhesus D positive was the highest at 90.3% and rhesus D negative was the lowest at 9.7%. This value is, however; lower than the values reported in some parts of Nigeria. This could be proved by the following finding: Rh-D positive and Rh-D negative frequencies were observed to be 98% and 2% respectively by Egesie et al., (2008). Ukaejiofor et al., (1996) also conducted similar research among the Igbos ethnic group of Eastern Nigeria and discovered that 96.7% of the population had Rh-D positive antigen on the surface of their red blood cells. Research done in Zamfara state by Erhabor et al., (2013) reported that the prevalence of Rhesus positive and negative among residents of Gusau was 98.8% and 1.2% respectively.

However the percentage frequency of Rhesus D negative is higher in other countries; in Gambella, Ethiopia, Golassa et al., (2017) reported that the overall proportion of patients devoid of the Rh (D) on the cell surface membrane of their red blood cells was 19.37%. This disagrees with our finding where Rhesus D negative individuals represent 9.5%.

A higher prevalence of Rh(D) positive is important because clinical situations like fetomaternal hemorrhage during pregnancy could arise through Rh incompatibility.

The current research also discovered that B Rhesus D positive blood type was the most prevalent at 39%, followed by O Rh-D positive 38.5%, A Rh-D positive 16%, AB Rh-D positive 7%, B Rh-D negative 4.5%, A Rh-D negative 2.5%, AB Rh-D 1.5% and O Rh-D negative was the ABO (Rh-D type) with lowest frequency 1%. This disagrees with previous reports in other parts of Nigeria; a prevalent pattern of (O > A > B > AB) was observed by Erhabor et al., (2010) among students in the Niger Delta, Jeremiah (2006) among students of African descent in Port Harcourt, Nigeria and Omotade et al., (1999) among healthy infant population in Ibadan, Nigeria.

Conclusion

This study discovered a high prevalence of Rh-D positive in the study area. The Rh-D positive was higher in males than in females while the Rh-D negative was lower in females than in males. The frequency of Rhesus D antigen based on the ABO blood group was prevalent in the pattern of B Rh-D +> O Rh-D +> A Rh-D +> AB Rh-D +> B Rh-D -> A Rh-D -> AB Rh-D -> O Rh-D -. This study will be useful in studying the susceptibility of diseases with regards to the Rhesus factor and may generate avital

information for population genetics and anthropological studies.

Contribution of authors

All authors have contributed uniformly in conducting the research and writing this article.

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Conflict of interest

We hereby declare that there is no conflict of interest.

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