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Distribution of ABO-Rh(D) blood group among nursing students: A tool for female health education

Adegoke AO[1], Amole IO[1], Adesina SA[1], Akinwumi AI[2], Adeleke OT[3], Idowu AE[4], Durodola AO[1], Olaolorun AD[1]

[1]*Department of Family Medicine, Bowen University, Iwo and Bowen University Teaching Hospital, Ogbomoso. Oyo State, Nigeria*
[2]*Department of Public Health, Adeleke University, Ede, Osun State, Nigeria*
[3]*Bowen University, Iwo. Osun State, Nigeria*
[4]*Department of Family Medicine, Bowen University Teaching Hospital, Ogbomoso. Oyo State, Nigeria*

Abstract

Background: The International Society of Blood Transfusion has documented 30 distinct blood group systems; the ABO and Rh systems are regarded as the most important blood group systems. Determining the ABO-Rh (D) blood group is vital in clinical settings to prevent the possibility of incompatibility and Rhesus D alloimmunization.
Objective: This study aimed to provide information on the distribution of blood groups and Rh factor among Bowen University Teaching Hospital School of Nursing students with the view of educating students about the risks of rhesus incompatibility.
Material and Methods: retrospective cross-sectional study which reviewed the preschool entry medical records of Nursing students of Bowen University Teaching Hospital Ogbomoso from 2019-2022. The data were systematically collated, analyzed and used to generate frequency tables.
Results: a total of 216 records were reviewed. The majority were females (84.3%), less than or equal to 18 years (48.6%) and with blood group O (44.4%) and rhesus positivity (94.0%). None from the male gender had an AB blood group. Prevalence of Rh(D) positive was higher among females (85.3%) while Rh(D) negative was higher among males (14.7%). There was a significant association between gender and Rhesus factor.
Conclusion: the findings from this study shows that blood group O and Rh(D) positive had the highest prevalence while the blood group AB and Rh(D) negative had the lowest prevalence. Therefore, effort should be made to educate the few who could suffer adverse events from Rhesus incompatibility.

Keywords: Antigen, Antibodies, Incompatibility, blood group, ABO blood group, Rhesus factor

Introduction

Blood is one of the most important body fluids that helps the body circulate nutrients, oxygen, hormones, and enzymes. Various blood group systems exist in humans, even though all blood has the same functions.[1] The International Society of Blood Transfusion has documented 30 distinct blood group systems; the ABO and Rh systems are regarded as the most important blood group systems.[2] Based on the presence of antigens and agglutinins, people are classified into four major blood groups in the ABO blood group: A, B, AB, and O.[3] Rhesus (Rh) blood type is ranked second only to

Corresponding Author:

Dr. Adepeju O. Adegoke
Department of Family Medicine, Bowen University, Iwo and Bowen University Teaching Hospital, Ogbomoso. Oyo State. Nigeria

adepeju.adegoke@bowen.edu.ng | +2347062377140

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the ABO blood group in its importance in blood transfusion biology.[4] The Rhesus system is categorized as Rh-positive or Rh-negative based on their presence or absence on the surface of red blood cells.[5]

Rhesus isoimmunization is defined as the development of antibodies against the antigen of another individual of the same species.[6] Its incidence is higher in Caucasians than in the blacks[7] and it is associated with haemolytic disease of fetus and newborn which could result in fetal loss.[8] This mortality has been reduced by 100-fold by timely administration of anti-D immunoglobulin prophylaxis for Rhesus negative females to prevent sensitization.[9] Screening for blood group has also been incorporated into routine antenatal booking test with counselling about its importance, cost and effectiveness in preventing complications that could ensue from incompatibility.

Teenagers are faced with many challenges including peer pressure and the urge to experiment with what they have seen or heard. Although, the major religious practices in Nigeria (Christianity and Islam) discourage premarital sex and abortion,[10] the Nigeria Demographic Health Survey, 2018 revealed that 19% of women begin sexual activity before the age of 15 while more than half (57%) begin before the age of 18.[11] This often leads to an unplanned pregnancy and unsafe abortion. Many low- and middle-income countries including Nigeria, have restrictive abortion laws. This leads to a high prevalence of unsafe abortion with resultant negative consequences on adolescents.[12]

One infrequent but grave consequence of unsafe abortion is Rhesus sensitization, encouraged by a lack of adequate information on Rhesus incompatibility by abortion seekers and unprofessional providers. This occurs when a Rhesus D positive fetal blood sensitizes the a Rh D negative mother following an abortion.[8] If the Rhesus group of the woman was known, sensitization could be prevented by administering anti-D immunoglobulin to a Rhesus D negative woman following an abortion, ectopic pregnancy, miscarriage or at delivery.[8,13]

This study aimed to provide information on the distribution of blood groups and Rh factor among Bowen University Teaching Hospital School of Nursing students where no data have been previously documented. The findings of this study could contribute to the existing pool of knowledge for health care planning, and transfusion services. It could also provide an opportunity for health-educating the population under study.

Materials and methods

This was a retrospective cross-sectional study which analyzed the pre-admission laboratory data of students admitted to the Bowen University Teaching Hospital School of Nursing, Ogbomoso over a period of three years (2019–2022). A total of 231 students were admitted over the study period. However, only 216 students had complete records and were included in this study. Approval for the study was obtained from Institutional Research Ethics Committee. Medical records of all the students were retrieved. Age, gender and laboratory results containing ABO and Rhesus blood group were extracted. To ensure patient confidentiality, data collected from the medical records was de-identified and only authorized personnel had access to it. The data were systematically collated, analyzed with SPSS version 26 and used to generate frequency tables.

Results

Table 1: Age range and gender of the study participants (N=216)

Age Range	Frequency (%)
≤18	105(48.61)
19-25	87(40.28)
>25	24(11.11)
Gender	
Male	34(15.7)
Female	182(84.3)

Table 2: ABO-Rh(D) Antigen of study participants (N=216)

ABO-Rh(D) Blood Group	Frequency (%)
O	96(44.4)
B	63(29.2)
A	54(25.0)
AB	3(1.4)
Rh(D) positive	203(94.0)
Rh(D) negative	13(6.0)

Table 3: Association between ABO-Rh(D) blood group and gender of the study participants

ABO-Rh(D) Blood group	Gender		Fishers Exact Test
	Male	Female	
Group A	10 (29.4)	44 (24.2)	0.888
Group B	10 (29.4)	53 (29.1)	
Group O	14 (41.2)	82(45.1)	
Group AB	0 (0.0)	3 (1.6)	
Rhesus Positive	29 (85.3)	174(95.6)	0.036
Rhesus Negative	5 (14.7)	8 (4.4)	

Table 1 shows age range and gender of the study participants. The majority of study participants aged 18 or less, and female gender had the highest proportion. Table 2 shows ABO-Rh Antigen of the study participants.

The distribution of ABO blood groups of the subjects revealed that blood group O was the most prevalent with 96 (44.4%). This was followed by blood group B with 63 (29.2%) and blood group A with 54 (25.0%). The least prevalent ABO blood group was AB 3 (1.4%). The distribution of rhesus blood group among the participants showed that 203 (96.0%) of the subjects had Rh (D) positive blood group, while 13 (6.0%) had Rh (D) negative blood group.

Table 3 shows association between ABO-Rh (D) and gender of the study participants.

Both genders had highest proportion with blood group O. Blood group A and B had equal presentation (29.4%) among male gender while females had higher presentation of blood group B than A. Only female gender had participants with AB blood group. There was no significant association between ABO blood group and gender. Rhesus D positivity had higher proportion with female gender while males had higher proportion with Rhesus D negative status. There was a significant association between Rh (D) status and gender.

Discussion

The ABO and Rh blood group systems are shared by all human populations, notwithstanding variations in the frequencies and distributions of particular types among various racial, ethnic, and socioeconomic groups as well as within individual communities.[14]

In this study, the age range of study participant was 16-44 years with a mean of 20.25. However, majority of the them were less than or 18 years old. This age group is very sensitive and important because unsafe abortion takes place in about 14% of women less than 20 years old in developing countries.[11] Although, the official age of entry to higher institution is 18 years, the majority were below 18 years. This could be because of competition for student enrolment among the increasing number of private higher institutions in Nigeria is promoting early school entry and a rush through elementary schools, flouting the government regulations on student age. Also, the wider age range gotten from this study when compared with the age range of 17-25 found among students in Markudi[15] and 18-30 found in Jos16 could be because Nursing Science offers better job opportunities in and outside Nigeria which was the reason while some older students opted for it. A similar retrospective study done among students in another private university in Nigeria[17] found a mean age of 19.5 which was slightly lower than what we found. However, Apecu et al[14] studied blood donors in rural Uganda and got a slightly higher mean age of 21.

This study has a female preponderance of 84.3%. This could be because of high premium placed on female education in South-Western Nigeria. This provides a better opportunity to educate students who are future parents on their blood group with greater attention on female students. This knowledge could help prevent the risk of ABO and Rhesus incompatibility and its complications such as Rhesus isoimmunization in these future mothers. Also, risk of neonatal jaundice could be envisaged and properly handled in their newborns with this knowledge. Similar studies done among students in Ede,[17] Jos,[16] Kogi[18] and Ekiti[19] reported female preponderance. However, other studies in Uganda[14] and Tanzania[20] among donors, and in Somalia[21] and Nigeria[15] among students found male preponderance.

The prevalence of Rh D negative blood group in the general population have been known to have some regional variations, being higher in white populations than other ethnic groups.[22]

In this study, we found a prevalence of 6.0%. Even though, this prevalence is low, Rh negative women are the obstetric high-risk group with poorer perinatal outcomes, and once sensitization has occurred, it is irreversible.[8,22] Other previous studies reviewed also reported a low Rh D negative prevalence.[1,2,5,14] This study found that majority (94.0%) of study participants were Rh Positive. This agrees with most studies conducted in different parts of the world. A review done in Nigeria by Anifowoshe et al[4] about gene frequencies of ABO and Rh blood groups found a similar result (94.0%). This also agrees with findings in South India[2] (95.96%) and Somalia[21] (95.8%). However, other

researchers reported a higher proportion than what was found in Uganda[14] (98%), Tanzania[20] (98%) and Liberia1 (98.8%).

The commonest blood group universally is blood group O.[1-4,20,21] ABO blood group distribution found in this study was O>B>A>AB. This agrees with other studies done in Nigeria,[15,18,19] Liberia[1] and South India.[2] However, other researchers in Nigeria[4,17,23] South West Uganda,[14] India[5] and Tanzania[20] reported O>A>B>AB. However, contrary to the above findings Barot et al[24] studied distribution of ABO and Rh Blood group among voluntary blood donors in Central Gujarat, India and found that blood group B had highest distribution then O, A, AB.

The distribution of ABO-Rh(D) blood group found in this study according to gender was compared with findings from other studies. This study shows that among male genders, blood group A and B had the same prevalence of 29.4% while group O was 41.2%. This prevalence is high when compared with findings by Ajayi et al[19] with prevalence of 6.2%, 10.4% and 24.6% respectively. None of the male participants reported AB blood group and this agrees with other researcher with prevalence of 0.8%.[19] The prevalence of Rh(D) positivity and negativity among males were 85.3% and 14.7%. This agrees with findings by another researcher in Nigeria.[23] This could be because the sample size used in both studies were small.

The prevalence of A, B, and O blood group was 24.2%, 29.1% and 45.1% while AB blood group was 1.6% among female gender. This result compares well with findings from other parts of Nigeria with prevalence of 21.5%, 24.6% and 49.2% respectively and 4.6% for AB blood group which was higher than what we found.[23] Prevalence of Rh(D) positive and Rh(D) negative among females was 95.6% and 4.4% in our study. This prevalence is higher when compared with findings among other group of students with prevalence of 55.6% and 2.4% respectively.[19] However, only one of the studies reviewed done among Nursing students in Madonna University[23] reported significantly high prevalence of Rh negativity of 23.08% among females and 14.55% among males. This may be because of the location of the study and the male-female distribution of the study participants. There was no significant association between gender and ABO blood group but Rh (D) factor had a significant association with gender.

Conclusion

This study shows that the distribution of ABO and Rh blood group among Nursing students in Ogbomoso is not very different from what was found in other studies but this information is necessary for educating female students about rhesus incompatibility as they prepare for their future life so as to empower them to take timely informed decisions about their health and life.

Study limitations

The retrospective nature, with the associated missing data, is one limitation of this study.

The small sample size is another limitation.

Recommendations

Blood group and Rhesus factor should be a part of routine screening for all teenagers.

To use every opportunity for health educating teenagers about the risk of rhesus incompatibility.

Government to subsidize the cost of immunoglobulin to make it affordable for those who need it.

A prospective study should be carried out in the general population.

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