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Distribution of Abo and Rhesus Blood Groups among First Year Students in College of Health Technology, Calabar, Cross River State, Nigeria

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Abstract: ***This study aims to examine the distribution of ABO and Rhesus blood group among first year students in College of Health Technology, Calabar, Cross River State, Nigeria. ABO and Rhesus phenotyping was carried out using standard tube technique. Of the 781 subjects tested, 480 (61.5 %) were of blood group O, 144 (18.4 %) were blood group A, while 138 (17.7 %) and 19 (2.40 %) were group B and AB respectively. 742 (95.01 %) were Rhesus D positive while 39 (4.99 %) were Rhesus D negative. When comparing ABO blood group distribution among different departments, O blood group was higher among Health Information Department (20.74 %). Health Information Department had the highest AB, B and A blood group of 0.64 %, 5.89 % and 5.63 respectively. Also, Health Information Department had the highest percentage (30.47 %) of Rhesus 'D' positive blood group and 2.43 % of Rhesus 'D' negative blood group. ABO blood groups among gender shows a higher prevalence among female students with a percentage of 52.11 %, 15.75 %, 14.85 % and 2.40 % for blood groups O, A, B and AB respectively compared to male students, 9.35 %, 2.69 %, 2.82 % and 0 %. In first year students of College of Health Technology, Calabar, gene frequencies with respect to the ABO system shows a formula O>A>B>AB indicating high prevalence of 'O' blood group and a predominance of allele A over allele B. Health Information Department had the highest prevalence of ABO and Rhesus D positive blood groups. Information obtained in this study will help in providing genetic counselling, medical diagnosis and in planning for future health challenges especially in blood transfusion.***

Keywords: College of Health Technology, ABO, rhesus, blood group, indirect antiglobulin test

1. Background to the Study

The ABO blood group system is used to mean the presence of one, both, or neither of the A and B antigens on erythrocytes (Schreiber, B. A.; Curley, R.; Gaur, A.; Rodriguez, E.; Rogers, K.; Sinha, S., 2017). For human blood bondings, it is the most significant of the 43 different blood type (or classification) presently recognized by the International Society of Blood Transfusions (ISBT) as of June 2021 (Storry, J. R.; Castilho, L.; Chen, Q.; Daniels, G.; Denomme, G.; Flegel, W. A.; Gassner, C.; de Haas, M.; et al., 2016). A mismatch (exceptionally uncommon in current medication) in this, or some other serotype, can cause a possibly lethal antagonistic response (adverse effect) after transfusion, or an undesirable insusceptible reaction to an organ transplant (Muramatsu M, Gonzalez HD, Cacciola R, Aikawa A, Yaqoob MM, Puliatti C, 2014). The related enemy of A and against B antibodies are generally IgM antibodies, created in the main long stretches of life by sensitization to natural substances like food, microbes, and infections.

The ABO blood classifications were found by Karl Landsteiner in 1901; he got the Nobel Prize in Physiology or Medicine in 1930 for this discovery (Maton, Anthea; Jean Hopkins; Charles William McLaughlin; Susan Johnson; Maryanna Quon Warner; David La Hart; Jill D. Wright 1993). ABO blood classifications are likewise present in different primates, for example, gorillas and Old World monkeys (Segurel, L.; Thompson, E. E.; Flutre, T.; Lovstad, J.; Venkat, A.; Margulis, S. W.; Moyse, J.; Ross, S.; Gamble, K.; Sella, G.; Ober, C., 2012).

The Rhesus (Rh) blood group system is a human blood group system. It contains proteins on the outer layer of red platelets. After the ABO blood group system, being engaged with bonding reactions is the most probable. It was found in 1937 by Karl Landsteiner and Alexander S. Wiener, who, at that point, trusted it to be a comparative antigen found in rhesus macaque red platelets.

The Rh blood group system comprises of 49 characterized blood group antigens, (Dean Laura, 2005) among which the five antigens D, C, c, E, and e are the most significant. There is no d antigen. Rh (D) status of an individual is ordinarily portrayed with a positive (+) or negative (-) addition after the ABO type (e.g., somebody who is A+ has the A antigen and Rh (D) antigen, while somebody who is A- has the an antigen yet misses the mark on Rh (D) antigen). The terms Rh factor, Rh positive, and Rh negative allude to the Rh (D) antigen as it were. Antibodies to Rh antigens can be associated with hemolytic bonding responses and antibodies to the Rh (D) and Rh antigens present critical gamble of hemolytic sickness of the baby and infant.

The two blood group systems have proved to be the most important for blood transfusion purposes. In ABO blood group, blood is divided into four major groups-A, B, AB, and O based on the presence or absence of the antigens A and B. Type A blood has type A antigens, type B has type B antigens, type AB blood has both types of antigens, and type O has neither A or B antigens. In addition, plasma from type A blood contains type B antibodies, which act against type B antigens, whereas plasma from type B blood contains type A antibodies, which act against type Aantigens. Type AB has neither type of antibody and type O has both A and B antibodies (dbRBC, 2011).

The distribution of ABO blood groups varies in different countries. In Australia, type O is about 49 %; type A, 38 %; type B, 10 %; type AB, 3 % and also in Canada, type O is about 46 %; type A, 42 %; type B, 9 %; type AB, 3 %. In Ogbomosho, Oyo state Nigeria, 50 % of the population are blood group O, 22.9 % blood group A, 21.3 % blood group

B and 5.9 % blood group AB (RHD, 2010). In Elele, Anambra state, Nigeria, the frequency distribution of blood group O was the highest with percentage frequency of 15.5, 18.1 and 19.2 % in Igbo, Hausa and Yoruba respectively, followed by blood group A and blood group B and the least percentage frequency is that of blood group AB in the three major ethnic groups (RHCE, 2010).

The frequency of Rhesus factor blood types differs in various populations (Harrison GA, Küchemann CF, Moore MA, Boyce AJ, Baju T, Mourant AE, et al., 1969). In African American, Rhesus (D) negative is approximately 7 % and Rhesus (D) positive is 93 %. In other Europeans, Rhesus (D) negative is about16 % and Rhesus (D) positive is 84 %. In African descent, Rhesus (D) negative is less than 1 % and Rhesus (D) positive is over 99 % (Harrison GA, Küchemann CF, Moore MA, Boyce AJ, Baju T, Mourant AE, et al., 1969).

The present study, therefore, aimed at providing information on the distribution of ABO and Rhesus Blood groups among first year students in College of Health Technology, Calabar, Cross River State.

2. Materials and Methods

This study was carried out in College of Health Technology, Calabar. All participants gave their informed consent prior to their inclusion in this present study. Participants were first year students admitted in the year, 2021 into College of Health Technology, Calabar. Blood tests were collected from all subjects by venipuncture into plain sample bottles for the determination of ABO blood and Rhesus blood groupings. ABO cell and serum grouping was completed in the span of two hours of blood assortment. A drop of Anti-A, Anti-B, and Anti-AB each was set in clean test tubes named 1, 2, and 3 and to each tube was added a drop of 5 % red blood cell suspension in saline. The substance were gently mixed together and permitted to remain at room temperature for 1hr after which they were analyzed for agglutination. For the serum grouping, a drop of 5 % A cells, B cells, and O cells were set in a clean test tubes marked 1, 2, and 3 and to each tube was added a drop of subject's serum. The items were gently mixed together and permitted to remain at room temperature for 1hr after which they were analyzed for agglutination. All negative results were confirmed microscopically. For the Rhesus grouping, a drop of seraclone Anti-D (RH1) was set in a clean named test tube and a drop of 5 % RBC suspension in saline of the subject was then added and incubated at 37°C. Toward the finish of the incubation time frames, the items in the cylinder were blended delicately and centrifuged for 30 seconds at 1000g. Agglutination was read macroscopically and microscopically. All negative or weakly reacting results were confirmed using the indirect antiglobulin test (IAT) system.

3. Results

Table 1: Prevalence of ABO blood groups among first year students of College of Health Technology, Calabar

ABO Blood Group	A	B	AB	O	Total
Number (%)	144 (18.4 %)	138 (17.7 %)	19 (2.4 %)	480 (61.5 %)	781 (100 %)

Table 2: Prevalence of Rhesus Antigen among first year students of College of Health Technology, Calabar

Rhesus Blood Group	Rhesus (D) Positive	Rhesus (D) Negative	Total
Number (%)	742 (95.01 %)	39 (4.99 %)	781 (100 %)

Table 3: Prevalence of ABO Blood groups among various departments of first year students in College of Health Technology, Calabar

Departments	ABO Blood Groups (Number %)				
	A	B	AB	O	Total
Environmental Health	25 (3.20 %)	19 (2.43 %)	1 (0.13 %)	64 (8.19 %)	109 (13.96 %)
Health Education and Promotion	19 (2.43 %)	18 (2.30 %)	2 (0.26 %)	73 (9.35 %)	112 (14.34 %)
Dispensing Opticianry	7 (0.90 %)	14 (1.79 %)	3 (0.38 %)	29 (3.71 %)	53 (6.79 %)
Radiography Technician	7 (0.90 %)	3 (0.38 %)	2 (0.26 %)	12 (1.54 %)	24 (3.07 %)
Pharmacy Technician	10 (1.28 %)	9 (1.15 %)	-	26 (3.33 %)	45 (5.76 %)
Community Health Extension Worker	24 (3.07 %)	17 (2.18 %)	3 (0.38 %)	72 (9.22 %)	116 (14.85 %)
Medical Laboratory Science	7 (0.90 %)	11 (1.41 %)	3 (0.38 %)	40 (5.12 %)	61 (7.81 %)
Health Information Management	44 (5.63 %)	46 (5.89 %)	5 (0.64 %)	162 (20.74)	257 (32.91 %)
Public Health Nursing	1 (0.13 %)	1 (0.13 %)	-	2 (0.26 %)	4 (0.51 %)
Total	144 (18.44 %)	138 (17.67 %)	19 (2.43 %)	480 (61.45 %)	781 (100 %)

Table 4: Prevalence of Rhesus Antigen among various departments of first year students of College of Health Technology, Calabar

Departments	Rhesus (D) Distribution		
	Rhesus (D Positive)	Rhesus (D Negative)	Total
Environmental Health	104 (13.32 %)	5 (0.64 %)	109 (13.96 %)
Health Education and Promotion	110 (14.08 %)	2 (0.26 %)	112 (14.34 %)
Dispensing Opticianry	53 (6.79 %)	-	53 (6.79 %)
Radiography Technician	24 (3.07 %)	-	24 (3.07 %)
Pharmacy Technician	42 (5.38 %)	3 (0.38 %)	45 (5.76 %)
Community Health Extension Worker	110 (14.08 %)	6 (0.77 %)	116 (14.85 %)
Medical Laboratory Science	58 (7.43 %)	3 (0.38 %)	61 (7.81 %)
Health Information Management	238 (30.47 %)	19 (2.43 %)	257 (32.91 %)
Public Health Nursing	3 (0.38 %)	1 (.013 %)	4 (0.51 %)
Total	742 (95.0 %)	39 (5.0 %)	781 (100 %)

Table 5: Prevalence of ABO Blood groups among first year students of College of Health Technology based on gender.

Gender	ABO Blood Groups (Number %)				
	A	B	AB	O	Total
Male	21 (2.69 %)	22 (2.28 %)	-	73 (9.35 %)	116 (14.85 %)
Female	123 (15.75)	116 (14.85 %)	19 (2.40 %)	407 (52.11 %)	665 (85.15 %)
Total	144 (18.44 %)	138 (17.67 %)	19 (2.40 %)	480 (61.46 %)	781 (100 %)

Table 6: Prevalence of Rhesus Antigen among first year students of College of Health Technology based on gender.

Gender	Rhesus 'D' Antigens (Number %)		
	Rhesus (D) Positive	Rhesus (D) Negative	Total
Male	109 (13.96 %)	7 (0.90 %)	116 (14.85 %)
Female	633 (81.05 %)	32 (4.10 %)	665 (85.15 %)
Total	742 (95.01 %)	39 (4.99 %)	781 (100 %)

A total of 781 students were tested in this study, of these, 480 (61.5 %) were of blood group O, 144 (18.4 %) were blood A, 138 (17.7 %) were blood group B and 19 (2.4 %) were blood group AB as shown in table 1. Table 2 shows the prevalence of Rhesus antigen among College of Health Technology students, Calabar.742 (95.01 %) were Rhesus (D) Positive, while 39 (4.99 %) were Rhesus (D) negative. When comparing prevalence of ABO blood groups among various departments in College of Health Technology, Calabar in Table 3, Health Information had the highest number of students with blood group O, 162 (20.74 %), blood group B, 46 (5.89 %), blood group A, 44 (5.63 %) and blood group AB, 5 (0.64 %) compared to other departments. Department of Public Health Nursing had the least prevalence of O, 2 (0.26 %), blood groups A and B, 1 (0.13 %) respectively. When compared to other departments. Also, when comparing the prevalence of Rhesus antigen among various departments in College of Health Technology, Calabar in Table 4, Health Information Management had the highest number of students with Rhesus (D) positive blood groups, 238 (30.47 %) and Rhesus (D) negative blood group 19 (2.43 %) compared to other departments. The least prevalence was found in Public Health Nursing. The prevalence of ABO blood groups among College of Health Technology Students when compared based on gender in table 5. It was highest among female students (407 (52.11 %), 123 (15.75 %), 116 (14.85 %) and 19 (2.40 %)) compared to male students (73 (9.35 %), 21 (2.69 %), 22 (2.82 %), 0 (0 %)) respectively for blood groups O, A, B and AB. Similarly, Rhesus Antigen blood groups among College of Health Technology, Students were compared based on gender in table 6. Female students had a higher prevalence of Rhesus (D) positive and negative groups (633 (81.05 %) and 32 (4.10 %)) compared to male students (109 (13.96 %) and 7 (0.90 %)) respectively.

4. Discussion

From this study, the distribution of blood group O was the highest followed by blood group A, blood group B and

blood group AB. This finding is in consistent with previous studies in other parts of Nigeria (Erhabor et al., 2010; Jeremiah, 2006; Falusi et al., 2000) which indicated that the prevalence of ABO blood groups followed a prevalence pattern (AB < B < A < O) among students of African descent in Port Harcourt, among students in the Niger Delta and among the Yoruba and Hausa ethnic groups, in five zones of Nigeria and in Ibadan respectively. However, our finding is at variance with previous report among Guinean population in which the frequencies of the genes A, B and O in the population were 14.70, 15.48 and 69.83 respectively (Loua et al., 2007). In Nigeria, in a study on 7653 individuals in Ogbomoso, Oyo State, 50 % had O blood group; 22.9 % had A blood group; 21.3 % had blood group B and 5.9 % had blood group AB (Bakare et al., 2006). The higher proportion of blood group O in this study may be a potential advantage because some previous reports (Ali et al., 2005; Avent, 1999) have shown that individual who are blood group O are less prone to severe malaria when compared with other blood groups (A, B & AB). The reason for less susceptibility to severe malaria attack among blood group O individuals may be due to mechanism of reduced rosettes formation by parasitized RBCs.

In this study, Rhesus positive blood (95.01 %) was predominant among various departments of first year students in College of Health of Health Technology, Calabar.4.99 % of Rhesus D negative was observed in our study and there are several obstetric connections associated with the prevalence of Rhesus D-negative blood among various departments of first year students of College of Health Technology, Calabar. This is because antibody produced by Rhesus D negative individuals as a result of exposure to Rhesus D antigens has serious clinical implications including hemolytic disease in the newborn and/or transfusion reactions. This finding is in agreement with previous report by Egesie and colleagues (2008) among non-Caucasians who observed Rh-D positive and negative rates of 98 % and 2 % respectively among their cohort of undergraduate students in the Niger Delta of Nigeria. Similarly, 96.7 % positive rate was recorded among the Igbo ethnic group of Eastern Nigeria (Ukaejiofor et al., 1996).

5. Conclusion

In this present study, the prevalence of ABO blood groups varies from department to department with Health Information Management Department having the highest, and gene frequencies with respect to the ABO system has shown a general formula of O>A>B>AB indicating high prevalence of O blood group and a predominance of allele A over allele B.95.01 % of the study population were Rhesus D positive while 4.99 % were Rhesus D negative with Health Information Management Department having the highest prevalence. Information obtained in this study will help in providing genetic counselling, medical diagnosis and in planning for future health challenges especially in blood transfusion.

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