Blood Group Patterns among Antenatal Clinic Attendees in a Tertiary Hospital in the Niger Delta, Nigeria

Basil Omieibi Altraide[1]*, Esther Nonye-Enyidah[1], Awopola Ibiebelem Jumbo[1], Mkpe Abbey[1]

[1]*Department of Obstetrics and Gynaecology, Rivers State University/Rivers State University Teaching Hospital, Port Harcourt, Nigeria*
Correspondence: Dr Basil O. Altraide,

Abstract
Background: knowledge of the blood group systems distribution in a pregnant population in a locality would ensure a better blood bank management and support to the pregnant population when haemorrhage occurs, be it ante-partum, intra-partum or post-partum. This would remarkably reduce the undesired consequences of post-partum haemorrhage secondary to a deficient blood bank blood supply. Post partum haemorrhage is listed as the commonest cause of maternal mortality or second to hypertensive disorders of pregnancy. Therefore an effective measure of preventing the hazardous consequences of the condition is effective blood bank support services whereby the bank was stocked with significant quantity of blood with popular and commoner groups.
Aim: The study was undertaken to establish the distribution of ABO and Rh (D) blood group systems among antenatal attendees at our facility.
Method: A retrospective cross-sectional study of blood group distribution among booked antenatal women in the Rivers State University Teaching Hospital in Port Harcourt, Nigeria. The case notes and laboratory records of antenatal women between January 2015 and December 2020 were retrieved and reviewed. The socio-demographic characteristics, gestational age and blood group distribution at booking were entered into a spreadsheet of IBM SPSS version 23 and analysed.
Results: A total of 9,990 women were booked for antenatal care within the study period. The majority of the women were aged between 30 and 39 years. More than half of the women (58.3%) registered for antenatal care in the second trimester. Most (97%) of the women were Rhesus positive. Blood group O was the most prevalent blood group (59%). When the ABO and Rh (D) systems are combined, the most prevalent blood group system among the women is O Rh (D) positive (56.81%), followed by A Rh (D) positive (22.33%) and B Rh (D) positive (14.95%). Blood group AB Rh (D) negative is the least prevalent blood group, occurring in 0.03% of the women.
Conclusion: The prevalence of the Rhesus factor is very high in the women. Blood group O Rh (D) positive is common. Blood banking services in the hospital should strive to make this universal donor blood readily available, if the morbidity and mortality associated with postpartum haemorrhage is to be mitigated.
Keywords: Blood group, Pregnancy, Antenatal attendees, Booking, RSUTH

Date of Submission: 12-01-2023   Date of Acceptance: 28-01-2023

I.   Introduction:

Prior to 1900 blood transfusion remained a nightmare. In 1900 Karl Landsteiner, at the University of Vienna, discovered the occurrence or absence of blood group antigens on the red cell membranes of individuals. Landsteiner identified three blood group patterns which he described as A, B and C (C was later renamed O)[1,2]. By 1901 a forth less frequent blood group, AB, was discovered. The Rhesus blood group system was discovered in 1940 by Landsteiner together with Alexander Wiener.

Currently, the International Society of Blood Transfusion recognizes about 33 blood group systems[2]. The ABO and Rhesus systems remain the most clinically important. For the ABO system, there are naturally occurring anti-A and/or anti-B antibodies in the serum of individuals aged 6-months and above. This is not so with the Rhesus system. Anti-Rhesus antibodies develop in Rhesus negative individuals only following exposure to Rh (D) positive red blood cells[2].

Information on the ABO and Rh (D) blood group systems along with their allele frequencies in any given population will make for an effective planning for a better blood banking and transfusion services. Use can also be made with such information for the resolution of medico-legal issues, settling of disputed paternity, helping in population genetic studies, population migration patterns, disease detection and in forensic science[3-6].

Blood group antigens are located on the surface of the red blood cell membrane. They are inherited by autosomal dominance, with most being co-dominant eg the A and B in the ABO system, the C and c in the Rh system, e.t.c[2]. The presence or absence of these blood group antigens determines the blood group of the individual. For the ABO system, four different blood groups are identified, viz group A, group B, group AB and group O. These signify the presence of antigen A, antigen B, antigens A and B and the absence of both antigen A and antigen B on the red blood cell membranes respectively. For the Rhesus system, about 50 antigens are identified. Of these the D, the C, the c, the E and the e antigens are of clinical significance. However the D antigen is of most clinical importance. The presence of the D antigen on the red cell membrane confers a positive status to that individual while its absence confers a negative status.

There is a noticeable variation in the occurrence of the ABO and Rh (D) blood groups in different geographical locations even among different regions within a country. Much work has been carried out in Nigeria to determine the proportion of occurrence of the ABO and Rh (D) blood group systems in different regions[4,5,7-11]. These studies were of mixed cohorts: population based, blood donors, students and pregnant women. This study is essentially aimed at ascertaining the distribution of the ABO and Rh (D) blood group systems in our antenatal population. The findings could be used to put an effective blood banking service in place for the pregnant women who are being cared for in the centre. With appropriate blood banking support services in place, the hazardous consequences of postpartum haemorrhage, a leading cause of maternal mortality in the hospital, could be mitigated.

II.   Method

This was a retrospective cross-sectional study of blood group distribution among booked antenatal women in the Rivers State University Teaching Hospital in Port Harcourt, Nigeria. The hospital is the largest state-owned health facility in Rivers state. The hospital serves as a primary, secondary, tertiary and referral centre to a population of over 7-million inhabitants around the nooks and cranies of the State and the neighbouring States[12]. Ethical approval was obtained from the institutional ethics committee.

The case notes and laboratory records of antenatal women between January 2015 and December 2020 were retrieved and reviewed. The socio-demographic characteristics, gestational age and blood group distribution at booking were entered into a spreadsheet of IBM SPSS version 23.0 (Armonk, NY) and analysed.

III.   Results

During the 6-year period spanning January 2015 through December 2020, a total of 9,990 women were booked for antenatal care. About two-thirds (62.4%) of the women were aged between 30 and 39 years, one-third (33.3%) were aged between 20-29 years and less than 1% were teenagers. Multiparae (Para 2 - 4) formed the majority of the study population (37.5%) followed closely by nulliparae (35.9%). Grandmultiparae (Para ≥ 5) formed 2.3% of the study population. The attendees in each of the first 2 years of the study constituted more than one-fifth of the study population (20.3% and 23.3% respectively). The year 2020 study population was the least, constituting 6.3% of the study population. Pregnant women with a tertiary level of education constituted 70.5%, a secondary level of education constituted 28.7% and a primary level of education and no formal education constituted less than 1% of the study population. Civil servants and traders formed the bulk of the women, 34.8% and 33.1% respectively. Majority of the women (58.3%) booked for antenatal care in the second trimester, a little short of one-quarter of the women (22.4%) registered in the third trimester while less than one fifth (19.3%) registered in the first trimester. Table 1 shows the socio-demographic characteristics of the women at booking. Table 2 shows the distribution of ABO and Rh (D) blood group patterns among the women. The majority blood group system in this study is O positive (56.81%). This is followed by A positive (22.33%) and then B positive (14.95%). The least prevalent blood group is AB negative (0.03%).

Ninety seven percent of the attendees are rhesus (D) positive and 3% are rhesus (D) negative. In reference to the ABO system, 59% belong to blood group O, 23% belong to blood group A and 15% belong to blood group B. Blood group AB is the least common blood group in the ABO system. This is shown in Table 3.

Table 1: Socio-demographic characteristics of the women at booking

Age group of the women at antenatal registration		
	Frequency	Percentage (%)
≤ 19 years	82	0.8
20 – 29 years	3247	32.5
30 – 39 years	6234	62.4
≥ 40 years	427	4.3
Total	9,990	100.0
Parity of the women at antenatal registration		
0	3586	35.9
1	2419	24.2
2 – 4	3751	37.5

≥ 5	234	2.3
Total	9,990	100.0
Yearly distribution of the women at antenatal registration		
2015	2030	20.3
2016	2323	23.3
2017	1369	13.7
2018	1879	18.8
2019	1761	17.6
2020	628	6.3
Total	9,990	100.0
Trimester of pregnancy at which the women registered for antenatal care		
First	1925	19.3
Second	5822	58.3
Third	2243	22.5
Total	9,990	100.0
Educational status of the women at antenatal registration		
No formal education	15	0.2
Primary	58	0.6
Secondary	2871	28.7
Tertiary	7046	70.5
Total	9,990	100.0
Marital status of the women at antenatal registration		
Married	9753	97.6
Single	237	2.4
Total	9,990	100.0
Occupation of the women at antenatal registration		
Civil servant	3479	34.8
Hair stylist	220	2.2
House wife	1805	18.1
Lawyer	15	0.2
Make-up artist	30	0.3
Medical Doctor	6	0.1
Seamstress	226	2.3
Student	690	6.9
Teacher	214	2.1
Trader	3305	33.1
Total	9,990	100.0

Table 2: Distribution of ABO and Rh (D) Blood group systems among the women that registered for antenatal care during the study period

S/No	Blood group system	Number	Percentage (%)
1	O positive	5675	56.81
2	A positive	2231	22.33
3	B positive	1494	14.95
4	AB positive	299	2.99
5	O negative	197	1.97
6	A negative	61	0.61
7	B negative	30	0.30
8	AB negative	3	0.03
	TOTAL	9,990	100

Table 3: Prevalence rate of ABO and Rh (D) blood group among the mothers

Blood group system	Phenotype	Number	Frequency	Prevalence rate (%)
ABO system	A	2292	0.23	23
	B	1524	0.15	15
	O	5872	0.59	59
	AB	302	0.03	3
Rh (D) system	Positive	9699	0.97	97
	Negative	291	0.03	3

IV.   Discussion

The findings of this study show that the predominant blood group pattern is blood group O with blood group AB being the least common. This finding is in agreement with the findings of most studies carried out in Nigeria[7-11,13-18]. This is also the finding of studies carried out in Uganda and Tanzania[19,20]. The sequence of occurrence of the ABO Blood group from this study is O > A > B > AB. This sequence however has regional

and ethnic variations, from results from other authors. The sequence found in this study agrees with that found in North Eastern Nigeria[7], South-South Nigeria[9,14], South Western Nigeria[11], North Western Nigeria[15], South Eastern Nigeria[18] and also in the meta-analysis of several studies carried out in Nigeria by Anifowoshe et al[4]. However other studies within these zones did not agree with this sequence of distribution of blood group pattern. Blood group B is noted to be more frequent than blood group A in the study by Babadoko et al[8] in North Eastern Nigeria, Mukhtar et al[16] in Northern Nigeria, Adienbo et al[12] in South-South Nigeria and Lugos et al[16] in North Central Nigeria. Remarkably in the study by Eledo et al among nursing students, the sequential pattern of distribution of blood group A and blood group B in the ABO blood group system is different in the male population compared to the female population[21]. Rhesus D prevalence among mothers is significantly high at 97%. Three percent of the women are Rhesus (D) negative. This level of high prevalence of the Rh (D) blood group was also reported in most of the studies carried out in Nigeria[7,8,17]. With antibodies to the Rhesus D antigen not occurring naturally but developing only following exposure to the Rhesus D antigen by the Rhesus negative mother, it is imperative that for the eradication of sensitization and thereby prevention of Rhesus isoimmunization, rhesus negative mothers exposed to the Rhesus D antigen be immunized against the antigen.
Limitations of the study
This study was a single-centre retrospective study. These pose limitations to this study.

V. Conclusion

Knowledge of blood group distribution in any given population could be life saving, particularly in emergencies. Blood group O Rh (D) positive is the commonest blood group pattern among antenatal women in the RSUTH while blood group AB Rh (D) negative is the least.

References

[1]. Farhud DD, Zarif Yeganeh M. A brief history of human blood. Iranian J Publ Health, vol. 42, No. 1, Jan 2013, pp. 1-6
[2]. Mitra R, Mishra N, Rath GP. Blood groups systems. Indian J Anaesth 2014;58:524-8
[3]. Sigamani K, Gajulapalli S. An insight into the distribution of allele frequency of ABO and Rh (D) blood grouping system among blood donors in a tertiary care hospital in Chengalpatu district of South India. Cureus 2022;14(4): e24207. DOI 10.7759/cureus.24207
[4]. Anifowoshe AT, Owolodun OA, Akinseye KM, Iyiola OA and Oyeyemi BF. Gene frequencies of ABO and Rh blood groups in Nigeria: A review. Egypt J Med Hum Genet, 2016;18:205-10 http://dx.doi.org/10.1016/j.emjhg.2016.10.004
[5]. Harbison Corey. 'ABO blood type identification and forensic science (1900 – 1960)' Embryo project encyclopedia (2016-06-02). ISSN:1540 – 5030; http://embryo.asu.edu/handle/10776/11341
[6]. Francini M, Mengoli C, Lippi G. Relationship between ABO blood group and pregnancy complications: a systematic literature analysis. Blood Transfus 2016;14:441-8 DOI 10.2450/2016.0313-15
[7]. Medugu JT, Abjah U, Nasir IA, Adegoke S, Asuquo EE. Distribution of ABO, Rh D blood groups and hemoglobin phenotypes among pregnant women attending a tertiary hospital in Yola, Nigeria. J Med Trop2016;18:38-42
[8]. Babadoko AA, Takai IU, Kawuwa MB. Distribution of ABO, Rh D blood groups and Haemoglobin phenotypes among antenatal clinic attendees in Federal Medical Centre Nguru, Nigeria. Bo Med J 2014; 11(2):86-91
[9]. Christian SG, Eze EM, Ezimah ECU, Buseri FI. Rhesus E, Rhesus D and ABO blood groups distribution among indigenes of Ogoni ethnic group of Rivers State, Nigeria. IJR2H 2020;3(1):1-7
[10]. Onoja OA, Ogli SA, Odutola AA and Enyikwola O. The distribution of the ABO and Rhesus blood groups among an indigenous ethnic group in Nigeria, Afr jour onlind (ajol) 2013, vol. 13, No. 2; 11 – 17
[11]. Iyiola, OA, Igunnugbemi, OO and Bello, OG. Gene frequencies of ABO and Rh (D) blood group alleles in Lagos, South-West Nigeria. Egyptian J Med Hum Genet 2012;13(2):147-153. https://doi.org/10.1016/j.ejmhg.2011.08.006
[12]. Demographic statistics bulletin. National Bureau of Statistics. 2017
[13]. Adienbo, OM, Nwafor, A, Egwurugwu, JN and Okon, UA. The distribution of ABO and Rhesus blood groups among indigenes of Ijaw ethnic group in Niger Delta Region, Nigeria. Global J Pur Appl Sci 2010,16(3):345-348
[14]. Erhabor, O, Adias, TC, Jeremiah, ZA and Hart, ML. abnormal hemoglobin variants, ABO, and Rhesus blood group distribution among students in the Niger Delta of Nigeria. Path Lab Med Int 2010;2:41-46
[15]. Buseri, FI and Okonkwo, CN. Abnormal hemoglobin genotypes and ABO and Rhesus blood groups associated with HIV infection among HIV-exposed infants in North Western Nigeria. Path Lab Med Int 2014;6:15-20
[16]. Mukhtar, IG, and Abdulkadir, AY. Frequencies of ABO and Rhesus (D) blood group phenotypes among pregnant women attending antenatal clinic at Murtala Muhammad Specialist Hospital, Kano, Nigeria. J Med Trop 2019;21:31-6
[17]. Lugos, MD, Polit, UY, Nnanna, OU, Vmamdem, NI and Damen, JG. Distribution of haemoglobin genotype, ABO and Rhesus (D) blood groups among pregnant women in North Central Nigeria. WJPMR 2018;4(6):54-58
[18]. Okoroiwu, IL, Obeagu, EI, Christian, SG, Elemchukwu, Q and Ochei, KC. Determination of the haemoglobin, genotype and ABO blood group pattern of some students of Imo State University, Owerri, Nigeria. Int J Curr Res Aca Rev 2015;3(1):20-27
[19]. Apecu, RO, Mulogo, EM, Bagenda, F and Byamungu, A. ABO and Rhesus (D) blood group distribution among blood donors in rural South Western Uganda: a retrospective study. BMC Res Notes 2016;9:513 DOI 10.1186/s13104-016-2299-5

[20]. Jahanpour, O, Pyuza, JJ, Ntlyakunze, EO, Mremi, A and Shao, ER. ABO and Rhesus blood group distribution and frequency among blood donorsat Kilimanjaro Christian Medical Centre, Moshi, Tanzania. BMC Res Notes 2017;;10:738 https://doi.org/10.1186/s13104-017-3037-3

[21]. Eledo, BO, Allagoa, DO, Njoku, I, Dunga, KE and Izah, SC. Distribution of haemoglobin variants, ABO blood group and Rhesus D among nursing students of Madonna University Nigeria. MOJ Taxicol. 2018;4(6):398-402 DOI: 10.15406/mojt2018.04.00136