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P1 Blood Group Antigen Dominant among Indigenes of Ogoni Ethnicity in Rivers State of Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author SGC designed the study, carried out the analysis, wrote the first draft of the manuscript and performed the statistical analysis. Author EME supervised and managed the analyses of the study. Author IE did the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The study aimed to determine the percentage distribution and frequency of occurrence of P1 blood group antigen among indigenes of Ogoni ethnicity in Rivers State of Nigeria.
Study Design: The study was a cross-sectional study conducted on Ogoni indigenes whose first generational parental origin is Ogoni. It consisted of one hundred and one apparently healthy subjects (fifty-two males and forty-nine females) within the age bracket of 30–60 years; free from transfusion transmissible infections after confirmation by serological testing.
Place and Duration of Study: Ogoniland is located along the Niger Delta Easten edge and to the North-East of Port Harcourt. All subjects were enrolled on the same day and their blood sample collected, transported and stored in cold chain (2 to 8°C) before the analysis which was carried out within 24 hours.
Methodology: The presence of the P1 blood group was identified using Anti-P1 monoclonal reagent, with method described and reagent prepared by Lorne Laboratories Ltd, UK.
Results: The study revealed the percentage distribution of the P1 blood group to be 81.18% in the total population with a frequency occurrence of 82.
Conclusion: The P1 blood group is dominant amongst the Ogonis, though not implicated in

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haemolytic transfusion reaction and haemolytic disease of the newborn, it can be associated with diseases caused by *Escherichia coli.* Therefore, it is necessary to put into consideration that indigenes of Ogonis with P1 blood group may likely be prone to *Escherichia coli* infections as a result of the presence of P1 antigen.

Keywords: P1 blood group; antigen; Indigenes of Ogoni; Rivers State; Nigeria.

1. INTRODUCTION

Different blood group antigens can be found in body fluids and on red blood cells. These antigens are the products of a single gene mutations (insertion, deletion, inversion, alternative splicing, single nucleotide polymorphisms) that are responsible for the antigenic differences. These genetic changes are responsible for producing a new and different antigen and can also result to a complete loss of antigenic expression [1]. The P1 antigen was discovered by Landsteiner and Levine in 1927 [2]. Anti-P1 is the antibody that is produced and it does not react generally at temperatures higher than room temperature. Anti-P1 has been rarely linked with haemolytic transfusion reaction and it has been found not to cause haemolytic disease of the newborn [2], therefore, the P1 antibody is usually not clinically significant [3].

The P1 antigen was so named P because P was the first letter after M, N, and O, which had already been assigned [4]. The P1 blood group system has been given the International Society of Blood Transfusion(ISBT) symbol and number of P1 (003). The antigen of the P1 blood group system is located on chromosome 22q11.2qter [5]. Its associated antigen is represented with P1 [6,5].

The P1 (Pk + P + P1+) is a common phenotype amongst Blacks with a frequency of 94%, and for the Whites, the frequency is 79%, while for P2(Pk + P + P1-) phenotype, the frequency in Blacks is 6% and 21% amongst the Whites [3]. Based on its biochemistry, the P1 antigens are carbohydrates on red blood cells and plasma glycolipids, distributed on red blood cells, lymphs, platelets, monocytes, fibroblasts and uro-epithelial cells and they are not present in secretions [3]. The P1 antigens in cord blood expression are weak and expression in adults is by 7 years [3]. P1 like antigens have been associated with parasitic infections [3]. P1 antibody is mainly of IgM, the IgG form is rare, and P1 antibody reacts mostly at room temperature and very few of P1 antibodies are involved in complement activation [3].

There is a reported considerable variation in the strength of expression of P1 on erythrocytes, which is inherited, and it partially depends on the allelic zygosity of P1 [7]. The P1 antigen is gotten by the addition of an α-galactosyl residue to a paragloboside. P1 antibody is naturally occurring in many individuals that are P1 negative. P1 antibody is frequently found in the serum of patients diagnosed with hydatid disease, acute hepatic fascioliasis and also those with liver fluke disease [4].

Antigens of the P1 blood group system are epitopes of carbohydrate carried on cell membrane glycosphingolipids. P antigens are synthesized by a step by step addition of sugars to precursor chains [8]. Lactosylceramide is the common precursor for the glycosphingolipids produced as a result of sugars being added to lactosylceramide [8]. Presently we have two main structural families for the classification of P antigens; the Globo family, which comprises of Pk, P, and Luke (LKE) antigens. The P1 antigen is part of the neolacto family, but there are other structural glycolipids which include Lc3, nLc4, X2, syalylparagloboside (SPG), and sialosyl-X2 and their individual oligosaccharide structures vary by their terminal sugars [8].

The P1 antigen is a member of the neolacto family (type 2 chain glycosphingolipids). A different pathway starts at lactosylceramide to build Lc3, then paragloboside, and then finally P1. Other structures are transformed from paragloboside (X2 and SPG). It is observed that the very same transferase that adds a terminal galactose to lactosylceramide producing the Pk antigen is also responsible for adding galactose to paragloboside, forming the P1 antigen [9].

For disease association, Parvovirus B19, which has been implicated in the cause of the fifth disease, makes use of erythroid precursor cells that expresses the P antigen for its replication [10,11]. Also, uropathogenic *Escherichia coli* that express pap-encoded adhesins usually binds to P1 and hence supports the growth of the bacteria in causing urinary tract infections [12,13]. P1 substance can be found in flatworms, and

tapeworm cysts in sheep livers, and the frequency and avidity of anti-P1 is increased in P1 individuals suffering from helminth infestations caused by hookworm [14].

Ogoni is one of the minority tribe in South-South Nigeria, located in the Western axis of the Niger Delta. Ogoni became part of Rivers State when the state was created by the Nigerian Government in 1967. The Ogonis represents about 0.05 percent of Nigeria population, with a population density of 1,233 persons/mile^2 making Ogoniland one of the densely populated areas in Nigeria [15]. There are evidences from archaeological and verbal history that shows that the people of Ogoni inhabited their location for over five hundred years. Traditionally, for administrative purpose the Ogoniland is divided into six kingdoms which are Babbe, Nyo-Khana, Ken-Khana, Tai, Gokana and Eleme. These kingdoms are further divided into three divisions based on language differences. The first division is the Khana division which is made up of four kingdoms (Nyo-Khana, Babbe, Ken-Khana, Tai) that speaks different dialects of the Khana language with distinct territorial boundaries. Khana division is located in the northern and eastern axis of Ogoniland. The second division is the Gokana division, a kingdom on its own, located in the south central axis of Ogoniland with Gokana being their language which is similar to Khana language but not identical to it. The third division is the Eleme division, which is also a kingdom. Eleme is located in the western axis of Ogoniland, and speaks a language that is related to Gokana and Khana but uniquely different [15]. In Nigeria political system of administration, based on senatorial district, the Ogonis are in the Rivers South-East senatorial district and occupies four local government areas (Khana, Tai, Eleme, and Gokana).

There is a dearth of published research information on the occurrence and percentage distribution of P1 blood group antigen amongst the Ogonis. Therefore, it is necessary to carry out serological identification of P1 antigen to identify how dominant this antigen is. This will then enable medical scientists to possibly associate it with diseases that have been linked to its presence, in further studies. This study is therefore aimed at determining the frequency occurrence and percentage distribution of P1 blood group antigen in the Ogoni ethnic group of Rivers State. This study of P1 blood group antigen amongst the Ogonis is novel.

2. MATERIALS AND METHODS

2.1 Study Design

This was a cross-sectional study carried out among indigenes of Ogoni whose first generational parental origin is Ogoni.

2.2 Study Area

Ogoniland is located in an area along the Niger Delta Eastern edge, and to the north-east of the Imo River and Port Harcourt city. Ogoniland covers about 1,036 Km^2 and borders the Bay of Guinea. Participants were recruited in Bori, the traditional headquarter of Ogoni, located on latitude: 4° 40' 34.64" N and longitude: 7° 21' 54.68" E. The laboratory analysis was conducted at the Post Graduate Laboratory of Rivers State University, Port Harcourt in Rivers State, Nigeria. Port Harcourt is the capital of Rivers State, and is located on latitude 4.75°N and longitude 7.00°E and lies along the Bonny River in the Niger Delta [16].

2.3 Study Population

One hundred and one (101) subjects comprising of fifty-two (52) males and forty-nine (49) females within the age bracket of 30 – 60 years were enrolled for the study. They were apparently healthy and free from transfusion transmissible infections after they tested negative to HIV, hepatitis and syphilis.

2.4 Collection of Blood Samples, Storage, and Transportation

After pre-test counselling and explanations, venous blood was drawn from the vein located at the antecubital fossa of the subject with the use of needle and vacutainer as described by Cheesebrough [17]. Three (3.0) mL of venous blood was collected into a glass vacutainer sample bottle that contains 0.5 mL of 1.2 mg/mL dipotassium ethylene diamine tetra-acetic acid. It was well mixed for the serological identification of the P1 blood group. Blood samples were analyzed within 24 hours of collection. Collected samples were all transported in cold chain (2 to 8°C), from Bori to Port Harcourt.

2.5 Methodology

2.5.1 Determination of P1 blood group using anti-p1 monoclonal

Method: standard tube method.

Tube method was used to phenotype red cells as described by Lorne Laboratories, UK. Lot No: 31553-A3; Expiry Date: 2021/03/08 [2]. Three percent (3%) red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-P1 reagent was added to one volume of the prepared 3% red cell suspension and properly mixed and incubated for 15 minutes at 2 - 8°C before it was centrifuged for 20 seconds at 1000 g. The red cells were gently re-suspended and read macroscopically for the presence of agglutination. The presence of agglutination is indicative of a positive result while on the contrary, a negative result is indicative of the absence of agglutination.

2.6 Statistical Analysis

Data collected were statistically analyzed by a simple percentage calculation.

3. RESULTS

3.1 Demographic Details of Study Population

One hundred and one (101) subjects comprising of fifty-two (52) males and forty-nine (49) females), within the age bracket of 30 – 60 years constituted the study subjects. Details are shown in Table 1.

3.2 Frequency Occurrence and Percentage Distribution of P1 Blood Group in the Study Population

The percentage distribution and frequency occurrence of the P1 blood group were analysed and recorded. Eighty-two subjects tested positive for the P1 blood group antigen. Details are shown in Table 2.

4. DISCUSSION

This study has revealed a P1 antigen frequency occurrence of 82 and a percentage distribution of 81.18% of P1 blood group positivity amongst the Ogonis. The percentage distributions based on gender from the 81.18% in the total population were 43.56% for males and 37.62% for females. The percentage from the 81.18% of P1 positivity was 53.66% for males while that of females was 46.34%. Our 81.18% distribution from the total population in this study is less than the percentage distribution reported by Reid and colleagues, and that of Down [3,8], where they reported a higher percentage distribution of 94% amongst Blacks; however, their reports agrees with our study that P1 blood group is dominant in Blacks, though theirs was higher by 12%.

Table 1. Demographic characteristics of the study population

Parameters	Frequency	Percentage (%)
Total number of subjects in the study	101	100
Total number of males in the study	52	51.5
Total number of females in the study	49	48.5
No. of subjects that were educated	101	100

Table 2. Frequency occurrence and percentage distribution of P1 blood group in the study population

Blood Group	Frequency occurrence	Percentage distribution (%)
P1: Positive Males and Females	82	81.18
P1: Positive Males in Total Population	44	43.56
P1: Positive Females in Total Population	38	37.62
Percentage Distribution Based on Gender from the 81.18 Percentage Positivity of P1		
Parameter	**Percentage (%)**	
Percentage distribution of males in positive case	53.66	
Percentage distribution of females in positive case	46.34	

Based on comparison with other tribes in Nigeria, the finding of our study was higher than the findings of Heiken and associates [18]. Heiken et al, in their study, carried out on the Yorubas, a major ethnic group in Nigeria, reported P1 blood group percentage distribution to be 72.5% [18]. In an earlier related study, Blumberg et al, reported that the Fulani tribe in Nigeria had a percentage distribution of P1 blood group positivity to be 78.25% [19], which is also high, but lower than our finding of 81.18%. In another African country, 74.6% and 89.2% of P1 blood group positivity were recorded in HIV negative and positive Botswanans, which also indicate the high percentage distribution of P1 blood group antigens amongst Blacks [20]. Based on the fact that the P1 antigen on red cells have adhesin attachment linkage point that could enable the attachment of *Escherichia coli* to red cells, indigenes of Ogonis may likely be prone to urinary tract infections.

5. CONCLUSION

The P1 blood group is a dominant blood group amongst the Ogonis. Although, the P1 blood group antigen has not been implicated in haemolytic transfusion reactions and haemolytic disease of the newborn, it has been associated with diseases caused by *Escherichia coli*. It is necessary to take into consideration the fact that indigenes of Ogonis with P1 blood group antigen may be prone to *Escherichia coli* infections, and as such, the association of P1 blood group antigen with *E. coli* infections needs to be studied amongst the Ogonis.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by the personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

Informed consent was obtained from apparently healthy subjects before enrolment upon approval by the Department of Medical Laboratory Science, Rivers State University, Port Harcourt.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Denomme GA. Molecular basis of blood group expression. Transfusion and Apheresis Science. 2011;44:53–63.
2. Lorne Laboratories. Monoclonal blood grouping reagents: Anti-P1 monoclonal. Document Reference Number: CEPI315. United Kingdom: Lorne Laboratories Ltd; 2018.
3. Reid ME, Calhoun L, Petz LO. Erythrocyte antigen and antibodies. In Lichtman MA, Beutler E, Kipps, TJ, Seligsohn U, Kaushansky K, Prchal JT, (Eds). Williams Haematology, 7th Edition, (pp 2119), New York: McGraw-Hill; 2006.
4. Reid ME, Lomas-Francis C, Olsson ML. The Blood Group Antigen Factsbook, 3rd Edition, Amsterdam: Academic Press (Elsevier); 2012.
5. Reid ME, Lomas-Francis C. Blood Group Antigen Fact Book, 2nd Edition, San Francisco: Academic; 2003.
6. Issitt PD, Anstee DJ. Applied Blood Group Serology, 4th Edition, Durham: Montgomery Scientific; 1998.
7. Thuresson B, Westman JS, Olsson ML. Identification of a novel A4GALT exon reveals the genetic basis of the P1/P2 histo-blood groups. Blood. 2011;117:678–687.
8. Downs T. Other Blood Group System. In: Quinley ED. (Eds) Immunohematology Principles and Practice, 3rd Edition, (pp 119-134), Philadelphia: Lippincott Williams & Wilkins; 2011.
9. Iwamura K, Furukawa K, Uchikawa M. The blood group P1 synthase gene is identical to the Gb3/CD77 synthase gene. Journal of Biological Chemistry. 2003;278(45): 44429–44438.
10. Brown KE, Hibbs JR, Gallinella G, et al. Resistance to parvovirus B19 infection due

to lack of virus receptor (erythrocyte P antigen). N. Engl J. Med. 1994;330:1192-1196.
11. Young NS, Brown KE. Parvovirus B19. N Engl J. Med. 2004;350:586-597.
12. Moulds JM, Moulds JJ. Blood group associations with parasites, bacteria and viruses. Transfus Med Rev. 2000;14: 302.
13. Ziegler T, Jacobsohn N, Funfstuck R. Correlation between blood group phenotype and virulence properties of *Escherichia coli* in patients with chronic urinary tract infection. Int J. Antimicrob Agents. 2004;24(Suppl 1):70-75.
14. Smart E, Amstrong B. Blood group systems. ISBT Science Series. 2008;3:68–92.
15. Oyinlade OA, Vincent JM. The Ogoni of Nigeria. Anthropology Faculty Publications. 2020;113.
16. ENCYCLOpedia.com. Ogoni. Available:https://www.encyclopedia.com (Accessed: October 10, 2019)
17. Cheesbrough M. District laboratory practice in tropical countries, 2nd Edition, Part 2. Cambridge: Cambridge University Press; 2010.
18. Heiken A, Balogun RA, Swan A, Rasmuson M. Population genetic studies in Nigeria. Hereditas. 1974;76:117-136.
19. Blumberg BS, Ikin EW, Mouranta E. The blood groups of the pastoral Fulani of Northern Nigeria and the Yoruba of Western Nigeria. Am. J. Phys. Anthropol. 1961;19:195-201.
20. Motswaledi MS, Kasvosve I, Oguntibeju OO. Blood group antigens C, Lub and P1 may have a role in HIV infection in Africans. PLoS ONE. 2016;11(2): e0149883.
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