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Kell Blood Group Antigens Not Found in Indigenes of Ogoni Ethnic Group of Rivers State, 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. Authors EME, ACUE and FIB approved the design of the study, supervised, managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim of the study was to determine the frequency of occurrence and percentage distribution of Kell blood group antigens in indigenes of Ogoni ethnic group of Rivers State, Nigeria.
Study Design: This was a cross-sectional study carried out among indigenes of Ogoni whose first generational parental origin is Ogoni. A total of 101 subjects (49 females and 52 males), within the age of 30–60 years were recruited for the study and they were apparently healthy and free from transfusion transmissible infections upon serological screening.
Place and Duration of Study: Ogoniland is located in an area along the Niger Delta Eastern edge,

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and to the north-east of the Imo River and Port Harcourt city. Ogoniland covers about 1036 Sq Km and borders the Bay of Guinea. All participants were recruited in Bori. Bori is the traditional headquarter of Ogoni. Bori is located on latitude: $4^0$40'34.64" N and longitude: $7^0$21'54.68" E. The analysis was carried out at the Post Graduate Laboratory of Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria. Port Harcourt, the capital of Rivers State, is located on latitude 4.75^0N and longitude 7.00^0E and lies along Bonny River in the Niger Delta. All subjects were recruited the same day and their blood samples collected on 2nd October, 2019, and analysis conducted on 3rd October, 2019.

Methodology: Identification of Kell blood group antigens was done using Anti-Kell monoclonal reagent, prepared by Lorne Laboratories Ltd, UK. Lot No: 76090-A5; Expiry Date: 2021/02/21. Phenotyping of red cells was done using tube method as described by Lorne Laboratory Ltd.

Results: The result showed zero frequency of occurrence and percentage distribution of Kell blood group antigen in the studied population (49 males and 52 females).

Conclusion: The presence of Kell blood group antigens in indigenes of Ogoni recruited for the study which serve as representative of the Ogonis was rare. It is therefore necessary to take into cognizance that haemolytic transfusion reactions due to Kell antigens and antibodies will rarely occur, and as such Kell blood group is not significant in blood transfusion and in antenatal and blood group serology amongst the Ogonis.

Keywords: Kell; blood; antigens; ogoni-indigenes; Rivers State; Nigeria.

1. INTRODUCTION

Blood group agglutinogens found on the red blood cells or body fluids are end products of a single gene that occur as a result of mutation, so changes at gene level such as deletions, insertions, alternative splicing, inversions, or single nucleotide polymorphisms is what causes the agglutinogenic differences. These genetic changes can produce new antigens and can also result to a total loss of expression [1]. The Kell blood group system which was reported in the nineteenth century of 1946 has anti-K as its antibody. The Kell antigen is developed at birth and it has been known to have strong immunogenicity. Anti-K is mostly associated with the well-known haemolytic disease of the newborn and also haemolytic transfusion reaction [2].

The Kell blood group system has been given the ISBT symbol/number as KEL [006]. It is located on chromosome 7q34. The Kell antigen is a very potent vasoconstrictor [3,4,5]). Kell antigen is a glycoprotein (an endothelin-3-converting enzyme), which preferentially cleaves big endothelin-3, and in the process, creates a bioactive endothelin-3, which is the potent vasoconstrictor [6]. Kell blood group system is a complex blood group system containing 24 antigens fully described to date. After ABO and Rhesus blood group system antigens, the Kell antigen is the most immunogenic blood group system antigen that can cause both haemolytic disease of the newborn and also immediate and delayed haemolytic transfusion reactions [7].

Kell blood group system has a frequency distribution of K-k+, K+k+, and K+k- phenotypes in Whites/Blacks as follows: 91/98%, 8.8/2.0%, and 0.2/rare% in the same order [8]. Kell antigen is a single pass glycoprotein type II that is highly folded with S=S bonds. Its molecular weight is 93 kDa with 732 amino acid residues [6]. Kell blood group was named after the first person (Mrs. Kelleher) that produced the antibody (anti-K) that caused haemolytic disease of the fetus and new-born [6].

Kell blood group antigens are expressed in normal adults, found on erythrocytes, bone marrow and fetal liver tissues. Kell antibody is mostly IgG, some are IgM in nature. They react mostly at 37ºC. They rarely activate complement and are implicated in haemolytic transfusion reactions and causes mild to severe haemolytic disease of the newborn. Kell antibody is a common immune antibody [6]. There have been reports of the presence of “naturally occurring” anti-K1 which occur as a result of infections with microorganism [7]. Anti-k is normally reported as alloantibody, though it is not an antibody that is common since most persons are k+ [7].

“The Ogonis are a minority ethnic people living in the Western Niger Delta Region of Southern Nigeria. During the 1970s, Ogoniland, or the Ogoni Nation, became part of Rivers State of

Nigeria. There are approximately 500,000 Ogonis who represent less than 0.05 percent of Nigeria's 100 to 120 million people. The population density of this region equals 1,233 people per square mile, making it one of the most densely populated areas of Nigeria" [9]. "Archaeological and oral historical evidence suggests that the Ogonis have inhabited the area for over 500 years. The Ogoni people are organized into traditional political systems referred to as kingdoms. There are six kingdoms that are divided into three separate yet united divisions. First, the Khana division is situated in the eastern as well as the northern-most portions of Ogoniland. It consists of four separate kingdoms: Babbe, Ken Khana, Nyo Khana, and Tai. Each kingdom speaks a dialect of the language Khana and maintains separate territories. Second, the Gokana division and kingdom lies in the south-central part of Ogoniland where the people speak Gokana, a language similar to, but not identical to, Khana. Third, the Eleme division and kingdom is found in Western Ogoniland. Although the Eleme language is closely related to both Khana and Gokana, it is distinctly different" [9].

There is dearth of research information on the occurrence of Kell blood group amongst the Ogonis, it is therefore necessary to carry out serological identification of Kell antigens to possibly rule out blood transfusion reactions and haemolytic disease of the new born due to Kell antigens/antibodies. This study is therefore aimed at determining the frequency occurrence and/or distribution of Kell blood group antigens in Ogoni ethnic group of Rivers State.

2. MATERIALS AND METHODS

2.1 Study Design

This is 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 1036 Sq Km and borders the Bay of Guinea. All participants were recruited in Bori. Bori is the traditional headquarter of Ogoni. Bori is located on latitude: 4^0 40' 34.64" N and longitude: 7^0 21' 54.68" E. The analysis was carried out at the Post Graduate Laboratory of Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria. Port Harcourt, the capital of Rivers State, is located on latitude 4.75^0N and longitude 7.00^0E and lies along Bonny River in the Niger Delta [10].

2.3 Study Population

A total of 101 subjects (49 females and 52 males), within the age of 30 – 60 years were recruited for the study and 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 antecubital fossa of the subject with the use of vacutainer as described by Cheesebrough [11]. 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 (EDTA). It was well mixed for the serological identification of Kell blood group. Blood samples were analyzed within 24 hours of collection. Collected samples were all transported under cold chain (ice packs/crushed ice in air tight and sealed thermo-container), from Bori (site of collection) to Port Harcourt (where analysis was carried out).

2.5 Methodology

2.5.1 Determination of Kell blood group using Anti-kell Monoclonal, Lorne Laboratories Ltd, UK. Lot No: 76090-A5; Expiry Date: 2021/02/21

Method: Tube method.

Phenotyping of red cells was done using tube method as described by Lorne Laboratory [2]. Three percent (3%) red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-K reagent was added to one volume of the prepared 3% red cell suspension and properly mixed and centrifuged for 20 seconds at 1000 g. The red cell button was gently re-suspended and read macroscopically for the presence of agglutination. Tubes that indicated a negative result were incubated for 15 minutes at room temperature, re-centrifuged again and then observed macroscopically for agglutination. Presence of agglutination indicated a positive

result, while absence of agglutination, indicated a negative result.

2.6 Statistical Analysis

Data collected was statistically analyzed by simple percentage calculation.

3. RESULTS

3.1 Demographic Details of Study Population

A total of 101 subjects (49 females and 52 males), within the age of 30 – 60 years were recruited for the study. Details are shown in Table 1.

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

The percentage occurrence of Kell blood groups was analysed and recorded. None of the subjects tested positive for Kell blood group antigens. Details are shown in Table 2.

Table 1. Demographic characteristics of study population

Parameters	Frequency	Percentage (%)
Total number of subjects	101	100
Total number of Males	52	51.5
Total number of Females	49	48.5
Age Range (Years)	30 – 60	-
No. of Subjects Educated	101	100

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

Blood Group	Total Population N (%)	FO	PD (%)
Kell	101 (100)	0	0
Kell: Males	52 (51.5)	0	0
Kell: Females	49 (48.5)	0	0

Key: FO = Frequency of Occurrence; PD = Percentage Distribution

4. DISCUSSION

From the study, it was observed that the presence of Kell blood group antigens in subjects recruited for the study were rare, which by implication means that Kell blood group and its associated antigens were not found amongst the study population and therefore said to be rare. The frequency occurrence of Kell blood group amongst the Ogonis and the percentage of occurrence of Kell blood group antigens was zero. This finding is consistent with that of Reid and Colleagues [8], and also with that of Downs [9], where they stated that the Kell antigen [K+k-] or Kell blood group is rare amongst the Blacks, and also consistent with Lorne Laboratories findings amongst Afro-Americans, where they reported that the antigen responsible for the Kell blood group is rare [2]. Based on other phenotypes of Kell blood group antigens K-k+ and K+k+, phenotypes, the finding of this study is not in line with that of Reid and colleagues [8], were they reported 98% of K-k+ phenotype in Blacks, and 2% of K+k+ phenotype amongst Blacks. Since there is a dearth of published findings of Kell blood group distribution among ethnic groups in Rivers State, Nigeria, this finding is novel. Furthermore, since Kell antigen is fully developed at birth, but was not found in any subjects recruited for the study, it implies that Kell antigen can/may not be associated with the occurrence of haemolytic transfusion reaction and haemolytic disease of the newborn amongst the Ogonis.

5. CONCLUSION

There is absence of Kell blood group antigen in indigenes of Ogoni recruited for the study which served as representative of the Ogonis. It is therefore necessary to take into cognizance that haemolytic transfusion reactions due to Kell blood group antigens and antibodies are rare, and as such, Kell blood group is not significantly important in blood transfusion services and in antenatal/blood group serology amongst the Ogonis.

CONSENT AND ETHICAL APPROVAL

Informed and written consent was obtained from apparently healthy subjects prior to enrolment upon ethical clearance by the Ethics Committee of the Department of Medical Laboratory Science, Rivers State University; and from the Rivers State Ministry of Health.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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