



Lewis Blood Group Percentage Distribution among Indigenes of Ogoni Ethnicity in Rivers State, Nigeria

**Serekara Gideon Christian^{1*}, Evelyn Mgbeoma Eze¹
and Beatrice Wobiarueri Moore-Igwe¹**

¹Department of Medical Laboratory Science, Faculty of Science, Rivers State University,
Nkpolu-Oroworukwo, P.M.B. 5080, Port-Harcourt, Rivers State, Nigeria.

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 BWMI did the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMMR/2020/v32i530420

Editor(s):

(1) Dr. Faris Q. Alenzi, Prince Sattam bin Abdulaziz University (PSAU), Saudi Arabia.

(2) Dr. Sandra Aparecida Marinho, Paraiba State University (Universidade Estadual da Paraiba - UEPB), Brazil.

(3) Dr. Babatunde Olanrewaju Motayo, Federal Medical Center, Nigeria and University of Ibadan, Nigeria.

Reviewers:

(1) Shigeki Matsubara, Jichi Medical University, Japan.

(2) Pichon Maxime, University Hospital of Poitiers, France.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/56053>

Received 10 February 2020

Accepted 19 April 2020

Published 25 April 2020

Original Research Article

ABSTRACT

Aim: We attempted to determine the frequency and percentage distribution of Lewis blood group antigens among indigenes of Ogoni ethnicity in Rivers State, Nigeria.

Study Design: The study consisted of 101 Ogoni people, who were apparently healthy and free from transfusion transmissible infections confirmed by serological screening. Ogoniland is located along the Niger Delta Eastern edge, and to the north-east of the Imo River and Port Harcourt city. All subjects were recruited and their blood samples were collected. The presence of Lewis-a and -b (Le^a/Le^b) blood group was examined using Anti-Le^a and Le^b monoclonal antibody, respectively (Lorne Laboratories).

Results: Le^a and Le^b blood group was observed in 17.8% and 11.9%, respectively.

Conclusion: Le^a and Le^b in this population was observed less frequently than those in other population previously reported. The Lewis antigen was reported to be associated with thrombotic disorders and *Helicobacter pylori* infection. Further studies may be directed to examine the association between Lewis blood group antigens and the risk of these conditions in Ogoni subjects.

*Corresponding author: E-mail: serekara.christian1@ust.edu.ng;

Keywords: Lewis blood group; Percentage distribution; Ogoni ethnic group; Rivers State; Nigeria.

1. INTRODUCTION

The Lewis blood group system has been given the ISBT symbol/number LE (007). It is located on chromosome 19p13.3. Its ISBT gene name is LE (FUT3) and its associated antigens include: Le^a, Le^b, Le^{ab}, Le^{bh}, ALe^b and BLe^b [1]. The Lewis blood group system was discovered by Mourant in 1946; it was named after one of the two original and main donors in whom anti-Le^a was noticed or identified [2] and the Lewis blood group system was recognized in 1946 [3].

The common phenotypes are: Le^{a+b-} [Le^a]; Le^{a-b+} [Le^b]. The frequency distribution of Le^a in Whites and in Blacks are 22% and 23% respectively, while the frequency distribution Le^b in Whites and in Blacks are 72% and 55 % respectively [3]. Lewis antigens are carbohydrates and they are found on type 1 precursor chains only. They are attached to lipids and protein in secretion [3].

The Lewis antigen are weakly expressed in cord blood, their expression in human begins at 2 years old [3]. The *Le* gene expresses a fucosyl-transferase that adds fucose in an α 1 - 4 linkage to the sub-terminal GlcNAc of the Type-1 chain only; galactose is already in α 1 - 4 linkage to the sub-terminal GlcNAc of the Type-2 chain [4]. The *le* allele is silent, while the *Le* allele produces a single antigen that is found as Le^a in non-secretors [glycosphingolipid with the oligosaccharide chain attached through D-glucose] and as Le^b in secretors [glycoprotein with the oligosaccharide chain attached through N-acetyl-D galactosamine] [4]. Thus, the Le (a+b-) or Le^a individual is a non-secretor [Le and se/se], the Le[a-b+] or Le^b individual is a secretor [Le and either Se/Se or Se/se], while the Le[a-b-] individual [le/le] can be either a secretor or non-secretor [5].

In human plasma, Lewis antigens are attached to erythrocytes, platelets and lymphocytes that are circulating by direct insertion of their lipid anchor into the plasma membrane of the above mentioned cells, while in body secretions, Lewis blood group antigens are also similarly attached to an amino acid component of the glycoprotein [4]. The Lewis antigens do not have their synthesis on the red blood cells, but are absorbed from plasma [6].

Lewis antibody Le^a and Le^{ab} occur as IgM in nature. They react at room temperature and they both activate complement. Anti-Le^a rarely cause

haemolytic transfusion reaction, while anti-Le^b does not. Both antibodies do not cause haemolytic disease of the new-born. Anti-Le^a is common in pregnancy, anti-Le^b is not clinically significant [3].

The Lewis agglutinogens, are biochemical structures synthesized by exocrine epithelial cells that are absorbed passively into red blood corpuscular bi-layers, and some group of Lewis agglutinogens function as counter ligands for selectins [7]; this has been observed to be consistent with the relationship of Lewis antigens in the occurrence or development of thrombosis [8]. Lewis-b(Le^b) is a receptor for *Helicobacter pylori* [9,10,1].

The people of Ogoni are among one of the minority tribes in the South-South geopolitical zone (Niger Delta) of Nigeria. In the 1970s, the Ogoni tribe became part of Rivers State. The Ogonis are approximately five hundred thousand in population which represent less than 0.05% of about one hundred and thirty million Nigerians. The Ogoni region has a population density that is equals 1,233 people/square miles, and therefore, one of the most densely populated region [11], in the country. Evidence from archaeological and historical oral information has it that the people of Ogoni have lived in this area for more than five hundred years. For traditional purpose of administration and organization, the people of Ogoni are divided into six kingdoms in three divisions. The first division is that of Khana which is located in the northern and eastern part of Ogoniland. Khana is made up of Nyo-Khana, Ken-Khana, Babbe, and Tai Kingdoms, with each kingdom having a dialect of Khana language, and they maintain separate territories. The second division is the Gokana division. Gokana lies in the south and central part of Ogoniland, with Gokana language that is similar to that of Khana language but not exactly the same. The Gokana division is a kingdom on its own. The third division is Eleme division and it is also a Kingdom on its own. Eleme is in the Western axis of Ogoniland, with language that is distinct and different from Khana and Gokana Language [11]. In the present day political system of Nigeria, Ogoniland is made up of four local government areas: Khana, Gokana, Tai and Eleme local government areas.

There is dearth of published research information on the occurrence and percentage distribution of Le^a and Le^b blood group antigen amongst the

Ogonis, it is therefore necessary to carry out serological identification of Le^a and Le^b antigens to identify how dominant these antigens are. This will then enable medical scientists to possibly associate it with diseases linked to its presence, in further studies.

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 Km² 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°40'34.64"N and longitude: 7°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°N and longitude 7.00°E and lies along Bonny River in the Niger Delta [12].

2.3 Study Population

One hundred and one subjects consisting of forty-nine females and fifty-two males, age between 30 to 60 years participated in 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 antecubital fossa of the subjects with the use of vacutainer as described by Cheesebrough [13]. 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 tetraacetic acid. It was well mixed for the serological identification of Le^a and Le^b blood groups. 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 Lewis-a blood group using Anti-le^a monoclonal, Lorne Laboratories Ltd, UK

Method: Standard tube technique.

Standard tube technique was used to phenotype red cells as described by Lorne Laboratories [14]. Three percent (3%) red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-Le^a reagent was added to one volume of the prepared 3% red cell suspension and properly mixed and incubated for 15 minutes at room temperature before it was centrifuged for 20 seconds at 1000 g. The red cell button was gently re-suspended and read macroscopically for the presence of agglutination. Presence of agglutination is indicative of a positive result while on the contrary, a negative result is indicative of absence of agglutination.

2.5.2 Determination of Lewis-b blood group using Anti-le^b monoclonal, Lorne Laboratories Ltd, UK

Method: Standard tube technique.

Standard tube technique was used for phenotyping of red cells as described by Lorne Laboratories [15]. Three percent (3%) red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-Le^b reagent was added to one volume of the prepared 3% red cell suspension and properly mixed and incubated for 15 minutes at room temperature before it was centrifuged for 20 seconds at 1000 g. The red cell button was gently re-suspended and read macroscopically for the presence of agglutination. Presence of agglutination is indicative of a positive result while on the contrary, a negative result is indicative of absence of agglutination.

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.

Table 1. Demographic characteristics of 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
Age range (years)	30 – 60	-
No. of subjects that were educated	101	100

Table 2. Frequency occurrence and percentage distribution of Lewis-a and Lewis-b blood groups in the study population

Blood group: Subjects	Frequency occurrence	Percentage distribution (%)
Le ^a : positive males and females	18	17.82
Le ^a : positive males	8	7.92
Le ^a : positive females	10	9.90
Le ^b : positive males and females	12	11.88
Le ^b : positive males	7	6.93
Le ^b : positive females	5	4.95

3.2 Frequency Occurrence and Percentage Distribution of Lewis-a and Lewis-b Blood Groups in the Study Population

The percentage distributions and frequency occurrences of Le^a and Le^b blood groups were analysed and recorded. Eighteen subjects were blood group Le^a positive, while twelve subjects were blood group Le^b positive. Details are shown in Table 2.

4. DISCUSSION

The Ogonis are not related to any other tribe in Nigeria, and also not one of the Major tribes in Nigeria. The Lewis blood group system is yet to be studied extensively in Rivers State, Nigeria and specifically amongst the Ogonis. How these antigens of the Lewis blood group are distributed amongst indigenes of Ogoni ethnic group is yet to be published before now. Some literatures have associated Lewis blood group antigens as risk factor for thrombotic diseases and infection with *Helicobacter pylori* [1,8-10]; therefore, the finding from this study may add to the preventive and management strategies of these diseases. This study has therefore revealed the presence of Le^a and Le^b amongst the Ogonis.

The study revealed that Le^a blood group showed a percentage distribution of 17.82% in the total population, with a frequency occurrence of 18 out of 101 subjects. This finding in terms of percentage distribution is lower in frequency than the finding reported by Lorne Laboratories [14],

where they reported 23% amongst Afro-Americans. Reid et al., Downs, and Leger [3,6,16], also reported a percentage distribution of 23%, therefore, the finding in their studies were higher than our own finding. In a study carried out on blood donors in Kano State, Northern Nigeria by Yusuf and colleagues [17] and presented at the 12th Haematologists Congress in London, UK, they reported a percentage distribution of Le^a to be 26.4%, which is also higher than our own finding of 17.82 %. Kano State in Nigeria is one of the state inhabited by the Hausa people.

For Lewis B (Le^b) blood group, the study revealed a percentage distribution of 11.88% in the total population with a frequency occurrence of 12. This is not in tune with the percentage distribution of 23 % as reported by Lorne Laboratories, [15], amongst Afro-Americans, and also in discord with Reid et al., Downs, and Leger [3,6,16], where they reported a high percentage distribution of 55% amongst Blacks. Furthermore, our findings differ from that of Yusuf et al. [17] by 3.22% as they reported 15.1 % in blood donors in Kano.

5. CONCLUSION

Lewis blood group antigens is present amongst the Ogonis in low frequency. Blood group Le^a and Le^b had frequency distributions of 17.82% and 11.88% respectively. The Lewis antigens has been associated with some thrombotic disorders and infection caused by *Helicobacter pylori*. We therefore advocate that further studies be directed to examine the association between

Lewis blood group antigens and the risk of these conditions in Ogoni subjects.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely 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 personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

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

ACKNOWLEDGEMENT

We wish to acknowledge Ms. Baridi Goodness Nkor, for her assistance during sample collection and during the test procedures for the determination of Lewis blood groups. Ms. Ebiye Mary Dresmann for assisting in the collection of blood samples from the study subjects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Reid ME, Lomas-Francis C. Blood Group Antigen Fact Book, 2nd edition, San Francisco: Academic; 2003.
2. Reid ME, Lomas-Francis C, Olsson ML. The Blood Group Antigen Factsbook, 3rd edition, Amsterdam: Academic Press (Elsevier); 2012.
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, New York: McGraw-Hill. 2006;2119.
4. Green C. The ABO, Lewis and related blood group antigens: A review of structure and biosynthesis. FEMS Microbiology Immunology. 1989;1:321–330.
5. Daniels G. Human blood groups. 3. Somerset, New Jersey: John Wiley and Sons; 2013.
6. Downs T. Other Blood Group System. In Quinley ED. (Eds) Immunohematology Principles and Practice, 3rd edition, Philadelphia: Lippincott Williams & Wilkins. 2011;115-134.
7. Foxall C, Waltson S, Dowbenko D, Fennie C, Lasky LA, Kiso M, Hasegawa A, As D, Brandly BK. The three members of the selectin receptor family recognize a common carbohydrate epitope, the sialyl Lewis (x) oligosaccharide. Journal of Cell Biology. 1992;117:895–902.
8. Clark P, Meiklejohn DJ, O'sullivan A, Vickers MA, Greave M. The relationships of ABO, Lewis and Secretor blood groups with cerebral ischaemia of arterial origin. Journal of Thrombosis and Haemostasis. 2005;3:2105–2108.
9. Daniels GL, Anstee DJ, Cartron JP, et al. Blood group terminology. ISBT working party on terminology for red cell surface antigens. Vox Sanguinis. 1995;69:265-279.
10. Issitt PD, Anstee DJ. Applied blood group serology, 4th edition, Durham: Montgomery Scientific; 1998.
11. Oyinlade OA, Vincent, JM. The Ogoni of Nigeria. Anthropology Faculty Publications. 113.
12. ENCYCLOpedia.com. Ogoni. Available: <https://www.encyclopedia.com> (Accessed: October 10, 2019)
13. Cheesbrough M. District Laboratory Practice in Tropical Countries, 2nd edition, Part 2. Cambridge: Cambridge University Press; 2010.
14. Lorne Laboratories. Monoclonal blood grouping reagents: Anti-Le^a monoclonal, Document Reference Number: CEPI632. United Kingdom: Lorne Laboratories Ltd; 2018.
15. Lorne Laboratories. Monoclonal blood grouping reagents: Anti-Le^b monoclonal, Document Reference Number: CEPI631. United Kingdom: Lorne Laboratories Ltd; 2018.
16. Leger RM. blood group terminology and the other blood groups. In Harmening DM. Mordern Blood Banking and Transfusion

- Practices, 6th edition, Philadelphia: FA Davis Company; 2012.
17. Yusuf JB, Gwaram BA, Abdullahi S, Tasiu M. Prevalence of Lewis, Kidd, Duffy, Kell and M blood group antigens among blood donors in Aminu Kano Teaching Hospital, Kano, Nigeria. 12th World Hematologists Congress; 2018; London, UK. 2018. J Blood Disord Transfus. 2018;9. DOI: 10.4172/2155-9864-C1-031

© 2020 Christian et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/56053>*