Original Research Article

Haemoglobin Genotype, ABO and Rhesus Blood Group Distribution in Briggs Family of Abonnema, Rivers State, Nigeria

ABSTRACT

Aim: The aim of this study was to assess the distribution of Haemoglobin genotype, ABO and Rhesus blood groups amongst members of the Briggs family in Akulga Local Government Area of Rivers State.

Study Design: This was a cross-sectional, field-based study carried out in Abonnema, Akuku-Toru Local Government Area in Rivers State.

Place and Duration of Study: Sample: Briggs Compound, Abonnema Town. Analysis was carried out at the Haematology Laboratory, Department of Medical Laboratory Science, Rivers State University, Port Harcourt, Nigeria, between June and August, 2018.

Methodology: Haemoglobin Genotype was done through Electrophoresis using the cellulose acetate method and ABO and Rhesus blood groups using the tube method. Blood samples were collected from a total of 100 members of Briggs Family (59 males and 41 females (age 6 to 60years).

Results: The data collated revealed that the ABO blood group frequencies were O Rhesus D positive 56%; A Rhesus D positive 24%; B Rhesus D positive 17% and AB Rhesus D positive 3% among members of the Briggs family with no Rhesus D negative subject. HbAA was the commonest haemoglobin genotype, possessed by 80% of the subjects, followed by HbAS with a prevalence of 20%. There was no subject with HbSS.

Conclusion: Greater percentage of members of the Briggs family was of blood group O Rhesus D positive and haemoglobin genotype AA, there were no Rhesus D negative and haemoglobin genotype SS amongst the members of Briggs family. There was no Rhesus D negative cases and haemoglobin SS genotype, in the sampled population.

Keywords*: Haemoglobin genotype, ABO and Rhesus blood group, Briggs family, Abonnema,*

1. INTRODUCTION

The Briggs family is one of the four major family compounds that makeup the Abonnema Town, a tribe in Kalabari kingdom in Rivers State. The Briggs family was formerly called Oruwari and its members are well known in all works of life as far as Rivers State is concerned, they are typically known to speak the Ijaw dialect as primary means of communication. Abonnema (originally known as Nyemoni, which means "covet your own" in the Kalabari dialect of the Ijaw languages group) is a larger town in the Kalabari kingdom that was founded in 1882. It was discovered by an expedition of a host of chiefs (Chief Young Briggs [a Kalabari warrior whose original name is Chief Inikeiroari Iso-owu Briggs], Other warriors like Chief Ekine Manuel, Chief Otaji, Chief Owukori Manuel, Chief Jack, Chief Young-Jack, Chief Boy Whyte, Chief Black Duke, with many others following behind him with their people), and together they made the town of Abonnema a reality. Four major family compounds makes up Abonnema, namely: Manuel(Owukori), Briggs (Oruwari), Georgewill (Otagi) and Jack (Iju). These family compounds are headed by head chiefs and the town headed by the head chief of the Manuel family via a system of Primus inter pares. Since its founding in 1882, Abonnema has been headed by a head chief from the Manuel (Owukori) house and the Amayanabo of Abonnema has come from the direct descendants of Chief Bob-Manuel who was once described by Mary Henrietta Kingsley (1862-1900) in her book West African Studies as "another chief of no mean capacity is Bob Manuel, of Abonnema, exceedingly neat, almost a dandy in appearance, a very shrewd trader, clear and concise in his speech, honourable in all his dealings, of a very reserved temperament." As at

now, Abonnema's Amayanabo is Chief Disreal Gbobo Bob-Manuel (Owukori IX). Amayanabo under kalabari custom is the head of Council of Chiefs and father of the town.[1]

The inherited disorders of haemoglobin are the most common single-gene disorders with 7% of the world's population being carriers according to World Health Organisation. [2] Inheritance pattern of the different types of haemoglobin variants is the basis for which sickle cell disease is established. Haemoglobin A (HbA), haemoglobin S (HbS), haemoglobin C (HbC) are some of the genes that are inherited. Haemozygous sickle cell anaemia (HbSS) is a disease condition in which a person inherits a haemoglobin S (HbS) from both parents and it is common in Africa. Also, sickle cell haemoglobin C (HbSC) is a disease condition in which an individual inherits HbC gene from one of the parent and HbS gene from the other and it is found in West Africa. [3]

The ABO and Rhesus blood grouping system are among the most important blood groups inhuman, and in the ABO blood group, individuals are classified into four major blood groups, A, B, AB and O, based on the presence of the antigens and agglutinins in them. Blood type A blood has A antigens, type B blood has B antigens, type AB blood has both types of antigens (A and B), and O blood type has neither A nor B antigens. In addition, plasma from type A blood individuals contains type B antibodies, which act against type B antigens, whereas plasma from type B blood individuals contains type A antibodies, which act against type A antigens. Blood type AB has neither type of antibody and type O blood has both A and B antibodies. [4]

The Rhesus blood group system has emerged as the second most important blood group system due to the haemolytic disease of newborn and its importance in Rhesus D negative individuals in subsequent transfusions once they develop Rhesus antibodies. Individuals are positive if they have a certain Rhesus antigen (the D antigen) on the surface of their red blood cells, and people are Rhesus negative if there is no Rhesus antigen on their erythrocytes. Rhesus incompatibilities have the potential of causing a major problem in some pregnancies when the mother is Rhesus negative and the foetus is Rhesus positive. [5]

Haemoglobin which is the oxygen carrying molecule of the erythrocyte has been found to vary at the molecular level. Sickle cell haemoglobin (HbS) differs from normal haemoglobin (HbA) because it has a valine in place of a glutamic acid in position six of the beta chain of globin molecule. When oxygen is reduced, erythrocytes containing sickle cell haemoglobin change from round biconcave disc shape to sickle-shaped cells. The sickle cell homozygote (HbS/HbS) almost always suffers anaemia. The sickle cell heterozygote (HbA/HbS) is only slightly anaemic and has resistance to malaria parasitaemia. [6] The normal homozygote (HbAHbA) is not anaemic and has no resistance to malaria. Thus, in areas where malaria is common, the fit genotype of the three appears to be the sickle cell heterozygote, which has resistance to malaria and only a minor anaemia.

The haemoglobin variants contained in an individuals blood which by implication affects the concentration of haemoglobin that will be present in such an individual, is critical in accurately predicting the functional competence of the blood to supply oxygen to the various body tissues and in predicting the possibility of having anaemia (sickle cell disease). Also, the ABO and Rhesus blood type in individuals is a key determining factor in predicting the occurrence of haemolytic disease of the newborn in couples who are of different Rhesus blood type, and in the availability of compatible blood in cases of emergencies where family related blood donation is required; hence the need for carrying out this research in Briggs family.

The aim of this study was to assess the distribution of haemoglobin genotype, ABO and Rhesus blood groups amongst members of the Briggs family in Abonnema, Akuku-Toru Local Government Area of Rivers State, Nigeria. The Objectives of the study were to (i) determine the haemoglobin genotype, ABO and Rhesus blood groups amongst the members of the Briggs family, (ii) evaluate the distribution of haemoglobin genotype, ABO and Rhesus blood groups amongst male and female in Briggs family, (iii) determine the distribution of haemoglobin genotype, ABO and Rhesus blood groups in different age groups of Briggs family.

2. MATERIALS AND METHODS

2.1 Research Design

This is a cross-sectional, field-based study carried out in Abonnema, Akuku-Toru Local Government Area, in Rivers State, specifically to determine the haemoglobin genotype, ABO and Rhesus Blood groups of members of the Briggs family in Abonnema, Akuku-Toru Local Government Area and determine the distribution of the aforementioned inherited red blood cell components.

2.2 Study Area

The study was carried out amongst the Briggs family in Abonnema Town, Akuku-Toru LGA of Rivers State. Abonnema is a larger town in the Kalabari kingdom that was founded in 1882. Abonnema is located at latitude 4° 43′ 23.22″ N and longitude 6° 46′ 43.85″ E. According to the 2006 census, there was 68, 591 people in Abonnema town.

2.3 Study Population

Whole Blood Samples was collected from a total of 100members of the Briggs family, Abonnema was collected and analyzed for their haemoglobin Genotype, ABO and Rhesus Blood Groups.

2.4 Eligibility of Subjects and Informed Consent

Non-members of the Briggs family were excluded from the study and only willing members of the Briggs family were enrolled. Oral informed consent was obtained from apparently healthy subjects prior to enrolment upon clearance by the Ethics Committee of the Department of Medical Laboratory Science, Rivers State University.

2.5 Sample Collection

4ml of blood was collected by venipuncture into a K_3EDTA anticoagulated (at a concentration of 1.2mg/ml), with sample container already labelled with patient's name, sex and age. Analysis was carried out within two hours of sample collection

2.6 Sample Analysis

Haemoglobin electrophoresis was carried out with method as described by Brown.[7] A small quantityof haemolysate of venous blood from each of the subjectswas placed on the cellulose acetate membrane andcarefully introduced into the electrophoretic tank containingTris/EDTA/Borate buffer at a pH of 8.9. The electrophoresiswas then allowed to run for 15 to 20 minutes atan electromotive force (emf) of 160 V. The results wereread immediately. Haemolysates from blood samples ofknown haemoglobin (i.e. AA, AS, AC) were run as controls at the same time.

Red cell phenotyping was carried out withstandard tube techniques as described by Judd[8]andBrecher. [9] For ABO blood phenotyping, a drop of anti-A, anti-B, and anti AB (Biotec, Ipswich, UK) each was placedin clean test tubes labelled 1,2,3. To each tube was addeda drop of 5% red blood cell suspension in saline. Thecontents were gently mixed together and centrifugedfor 30 seconds at 1000g. The cell buttons werere-suspended and observed foragglutination. Agglutinationof tested red cells constituted positive results. Asmooth cell suspension after resuspension followed by a microscopic confirmation constituted negative test results.

2.7 Statistical Analysis

Statistical analysis was done using Microsoft Excel to defining the percentage frequency of the various blood groups and the genotype in Briggs family. Data are represented in Tables.

3. RESULTS

3.1 Demographic Details of Participants

A total of 100 persons all from the Briggs Family were recruited for this study. Ranging from: children (6years, adolescents, to adults (60years), as well as males and females. Details are shown in Table 1.

3.2 Percentage Distribution of ABO and Rhesus Blood Groups among Members of Briggs Family

The Percentage distribution of ABO and Rh Blood Groups among members of Briggs family were 24%, 3%, 17%, and 56% for A Rhesus D positive, AB Rhesus D positive, B Rhesus D positive and O Rhesus D positive respectively, there was no member of the Briggs family with Rhesus D Negative as shown in Table 2

3.3 Haemoglobin Genotype Distribution among Members of Briggs Family

The percentage distribution of haemoglobin genotype among members of the Briggs family was 80% and 20% for AA and AS respectively as shown in Table 3.

3.4 Percentage Distribution of ABO and Rhesus Blood Groups among Members of Briggs Family Based on Gender

The percentage distribution of ABO and Rh Blood Groups among the male members of Briggs family are 15%, 1%, 8% and 35% for A+, AB+, B+ and O+ respectively; among female members are 9%, 2%, 9%, and 21% for A+, AB+, B+ and O+ respectively as shown in Table 4.

3.5 Percentage Distribution of Haemoglobin Genotypes among Members of Briggs Family Based on Gender

The percentage distribution of Haemoglobin Genotypes among the male members of Briggs family are 46% and 13% for AA and AS respectively; among female members are 34 and 7% respectively as shown in Table 5.

3.6 Percentage Distribution of ABO and Rhesus Blood Groups among Members of Briggs Family Based on Age Category

The percentage distribution of ABO and Rh Blood Groups among the members of Briggs family that are children are 4%, 1% and 6% for A+, B+ and O+ respectively; adolescent members are 3%, 3% and 9% for A+, B+ and O+ respectively; for adult members are 17%, 3%, 13% and 41% for A+, AB+, B+ and O+ as shown in Table 6.

3.7 Percentage Distribution of Haemoglobin Genotypes among Members of Briggs family Based on Age Category

The percentage distribution of Haemoglobin Genotypes among the members of Briggs family that are children are 8% and 3% for AA and AS respectively; adolescent members are 12% and 3% for AA and AS respectively; for adult members are 60% and 14% for AA and AS respectively as shown in Table 7.

Table 1. Demographic Details of Participants

Subjects	Frequency (%)
Males	59 (59)
Females	41 (41)
Total	**100 (100)**
Children	11 (11)
Adolescent	15 (15)
Adults	74 (74)
Total	**100 (100)**

Table 2. Percentage Distribution of ABO andRh Blood Groups among Members of Briggs Family

Parameters		Frequency (%)
ABO and Rh Blood Group	A+	24 (24)
	AB+	3 (3)
	B+	17 (17)
	O+	56 (56)
	Total	**100 (100)**

Key: A+ = Group A Rh "D" Positive; AB+ = Group AB Rh "D" Positive; B+ = Group B Rh "D" positive; O+ = Group O Rh "D" positive.

Table 3. Percentage Distribution of Haemoglobin Genotype among Members of Briggs Family

		Frequency (Percentage)
Haemoglobin Genotype	AA	80 (80)
	AS	20 (20)
	SS	0
	Total	**100 (100)**

Table 4. Percentage distribution of ABO and Rhesus Blood Groups among Members of Briggs Family Based on Gender

	Gender		Frequency (Percentage)
ABO and Rh Blood Group	**Males**	A+	15 (15)
		AB+	1 (1)
		B+	8 (8)
		O+	35 (35)
		Total	**59 (59)**
	Females	A+	9 (9)
		AB+	2 (2)
		B+	9 (9)
		O+	21 (21)
		Total	**41 (41)**
		Grand Total	**100 (100)**

Key: A+ = Group A Rh "D" Positive, AB+ = Group AB Rh "D" Positive, B+ = Group B Rh "D" positive, O+ = Group O Rh "D" positive

Table 5. Percentage Distribution of Haemoglobin Genotypes among Male and Female members of Briggs Family Based on Gender

	Gender		Frequency (Percentage)
Haemoglobin Genotype	**Males**	AA	46 (46)
		AS	13 (13)
		SS	0
		Total	**59 (59)**
	Female	AA	34 (34)
		AS	7 (7)
		SS	0 (0)
		Total	**41 (41)**
		Grand Total	**100 (100)**

Table 6 Percentage Distribution of ABO and Rhesus Blood Groups among Members of Briggs family based on Age Category

	Age group (male and female)		Frequency (Percentage)
ABO and Rh Blood Group	**Children**	A+	4 (4)
		AB+	0
		B+	1 (1)
		O+	6 (6)
		Total	**11 (11)**
	Adolescence	A+	3 (3)
		AB+	0
		B+	3 (3)
		O+	9 (9)
		Total	**15 (15)**
	Adults	A+	17 (17)
		AB+	3 (3)
		B+	13 (13)
		O+	41 (41)
		Total	**74 (74)**
		Grand Total	**100 (100)**

Key: A+ = Group A Rh "D" Positive, AB+ = Group AB Rh "D" Positive, B+ = Group B Rh "D" positive, O+ = Group O Rh "D" positive

Table 7. Percentage Distribution of Haemoglobin Genotypes among Members of Briggs Family based on Age Category

	Age group Male and female	Frequency (Percentage)

Haemoglobin Genotype	**Children**	AA	8 (8)
		AS	3 (3)
		SS	0
		Total	**11 (11)**
	Adolescence	AA	12 (12)
		AS	3 (3)
		SS	0
		Total	**15 (15)**
	Adults	AA	60 (60)
		AS	14 (14)
		SS	0
		Total	**74 (74)**
		Grand Total	**100 (100)**

4. DISCUSSION

Haemoglobin variants and blood groups are all inherited blood characters and are known to play critical roles in diseases, blood transfusion and selection of spouses. The data collated revealed that the ABO blood group frequencies were found in the order O > A > B > AB (56%, 24%, 17% and 3%) respectively among members of Briggs family. The data is in agreement with other reports in Nigeria where the same trend was also observed(O Rhesus D positive; 52.93%, A Rhesus D positive; 22.77%, B Rhesus D positive; 20.64% and AB Rhesus D positive 3.66%), [10] [11] [12] as well as in agreement with other reports from most parts of the world as reported from a study on 3,086,215 individuals belonging to different race/ethnic groups in USA (O;46.6%, A;37.1%, B;12.2% and AB;4.1%). [13]

The distribution of ABO and Rhesus blood groups in this study revealed a greater percentage of the subjects having O Rhesus D positive (56%), this is in consonance with a study in Port Harcourt, Rivers State which revealed that the frequency of group O Rhesus D positive was 55.16%. [14] This goes to confirm that group O appears to show predominance over the other blood groups in Rivers State. The high frequency of group O in Port Harcourt, Rivers State as also observed amongst the Briggs family provides an advantage in terms of availability of blood for blood transfusion especially in emergencies.

The frequency of Rhesus D antigen in this study was 100% since none of the subjects were Rhesus D negative. A similarly high percentage of 96.7% recorded for the Igbos,[15] and similar to 95% found in Port Harcourt, [16][14] this can be said to be of an advantage in the study area especially in women as the likelihood for the development of anti–D which can cause both moderate and severe form of haemolytic disease of newborn is at a very low minimum or unlikely.

The result of the study shows that the HbAA was the commonest haemoglobin genotype, possessed by 80% of the subjects, followed by HbASwith a prevalence of 20%. There were no subjects with HbSS. This in agreement with Jeremiah,[14] who recorded the frequency of HbAAas 80.32%, HbAS was found to be 19.68% whereas HbSS did not occur among the 620 participants in his study. This trend was similarly recorded by Umoh and colleagues,[17] where the result of their study showed that the HbAA was the commonest haemoglobin genotype with a percentage distribution of 78.7%, followed by HbAS, 19.6% and HbSS with a prevalence of 1.5%.

In this study, sex and age were not considered critical; rather the results depended on the genetic constitution of the subjects. However, the distribution of the blood groups and haemoglobin genotypes among different age groups and sex were analysed. In this study majority of the members of the Briggs familythat participated were adults and the inherited characters were better distributed amongst them than in children and adolescence. The same trend observed in the general percentage distribution was observed amongst the males and female subjects.

5.CONCLUSION

In conclusion the greater percentage of members of the Briggs family was of Blood Group O Rhesus D positive and haemoglobin Genotype AA (HbAA), there were no Rhesus D negative and haemoglobin genotype SS (HbSS) amongst the members of Briggs family in Abonnema, Rivers State.

Though there were no Rhesus D negative cases and haemoglobin SS genotype amongst some members of the Briggs family in Abonnema, it is necessary to ensure that regular screening for these inherited red cell components is encouraged and maintained as well as the sensitization and education of the populace on the significance of haemoglobin genotype, ABO and Rhesus Blood groups on in blood transfusion as well as choice of spouses.

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