



Knowledge of Rh (Rhesus) D Blood Group, Risk Factors and Burden of Rh D Alloimmunisation among Female Secondary School Students in Ikorodu, Lagos, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors OAA and OOO conceived the study. Authors OAA, OA and OOO designed the study protocol, performed literature searches and executed the study procedures. Authors OAA and AAS analyzed the results and wrote the first draft. All authors read and approved the final manuscript.

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ABSTRACT

Background: Rh (Rhesus) blood group antigen especially D antigen plays a pivotal role in provision of safe blood and safe pregnancy. Antigen mismatch between blood donor and recipient or pregnant woman and the foetus sets the stage for immunohaematological complication such as haemolytic transfusion reaction and haemolytic disease of the foetus and newborn. Individual knowledge of the Rh blood group status among females of reproductive age group is a contributory measure for effective control and prevention of untoward complications of antigen mismatch.

Objective: This study assessed the level of awareness of own Rh D blood group status among female secondary school students, their risk for alloimmunisation, the distribution of Rh D antigen

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and the burden of alloimmunisation.

Materials and Methods: A cross sectional study of 927 female secondary school students in Ikorodu, Lagos, South-West Nigeria was performed. A multistage sampling technique was used. Ethical approval was granted by Lagos University Teaching Hospital's (LUTH) Health Research and Ethics Committee and permission granted by Lagos State Ministry of Health. Parental/guardian and student informed assent consent were obtained. Relevant data on socio demographics, knowledge of Rh D blood group, and risk factors for alloimmunisation were collected using a structured interviewer-administered questionnaire. Blood specimen was collected from all participants and tested for Rh D blood group and alloantibody (Anti D) status using standard protocols. Results are presented in frequency tables.

Results: Sixty-eight (7.3%) have heard about Rh blood group system. About 6.7% of the participants described Rh system as an independent system, while 6.5% described the Rh system as a part of ABO antigen system. Of the 122 students who knew their blood group, only 106 (86.9%) were correct about their Rh D status after being tested. Known risk factors for Rh D alloimmunisation such as pregnancy and blood transfusion were observed in 53 (5.7%) of the participants. About 96.7% of the participants were Rh D positive. None of the Rh D negative female students was allo-immunised.

Conclusion: This study observed poor awareness/knowledge regarding the Rh (rhesus) blood group system among secondary school females in Ikorodu Local Government Area of Lagos State, Nigeria. Though, none of the participant was alloimmunised to the Rh D antigen, 5.7% had significant risk factors. Efforts should be directed at improving the awareness/knowledge of the rhesus blood group system and its reproductive implications particularly among female secondary students in Ikorodu, Lagos and other parts of Nigeria.

Keywords: Awareness; knowledge; Rh D; rhesus; risk factors; alloimmunisation; Lagos; Nigeria.

1. INTRODUCTION

The Rhesus (Rh) blood group system is the next most clinically significant Blood Group (BG) system, following ABO BG system [1,2]. Generally, the clinical significance of any BG system is related to its ability to induce clinically significant allo-antibodies and the frequency of their allo-antibodies in the population [3,4]. Currently, 35 BG systems are recognized by the International Society of Blood Transfusion (ISBT) and Rh BG system is the fourth [5]. Rh antigens are encoded by two closely linked genes on the short arm of chromosome 1 at locus 1p36.1 [6].

The Rh BG system is highly polymorphic and over 50 different antigens have been described. [5,6] In terms of their clinical significance, the five major Rh antigens include D, C, c, E and e. However, the D antigen is the most immunogenic. As such, in routine pre-transfusion compatibility testing, only ABO and Rh D antigens are typed and matched in the recipient and donor [4,7,8]. Extended red cell phenotyping for Rh, Kell and other BG systems is often restricted/limited to patients at risk of alloimmunisation from multiple transfusions, multiple gestations and chronic transfusions as in sickle cell disease [8].

The distribution of Rh D antigen significantly varies with race. About 85% of the Caucasian population is positive for the Rh D antigen [9]. The prevalence of the D antigen is higher in Africans and appears to be lower in Asians [9]. In Nigeria, various studies have been reported on the frequency of Rh D antigen in different parts of the country; studies from different localities show D antigen negative prevalence of 6% in Lagos [10], 2.9% in Kano [11], 5% in Ilorin [12], 1.2% in Gusau, Zamfara [13], 6.12% in Benin City [14], 3.3% in Ogbomosho [15], 5% in Port Harcourt [16], 5.56% in Calabar [17], 4.3% in Abuja [18], 3.32% in Uyo [19] and 2% in Bayelsa [20].

Rh D negative individuals are at risk of alloimmunisation following exposure to potentially sensitizing events such as allogeneic blood transfusion and transplacental exposure. This is particularly of interest in Rh D negative women of childbearing age due to the possibility of exposure to paternally acquired Rh D positive foetal red cells during cyesis. Rh D alloimmunisation in females of childbearing age is associated with adverse foeto-maternal outcomes resulting from haemolytic disease of the foetus and the newborn (HDFN) and haemolytic transfusion reaction (HTR) [4,21].

Secondary to the global rise in teen sexual activity with a trend to earlier onset, teen pregnancy is now on the increase and is becoming a public health problem worldwide especially in sub-Saharan Africa [22-25]. World Health Organisation (WHO) estimates that about 16 million women between the ages of 15-19 years give birth each year and 14% of all unsafe abortions in low and middle income countries occur in this age group [24,25]. About 2.5 million adolescents are reported to have unsafe abortions every year [25]. In Nigeria, prevalence of sexual activity among teenagers vary between 5.7% and 25.7% and studies have reported up to a 100% abortion rate among this age group [23,26]. It is important that all females of reproductive age irrespective of age should be aware of their Rh D status and educated regarding its implications for child bearing, in order to prevent bad obstetric outcomes in future.

1.1 Objectives

The study objectives were to determine the level of awareness regarding own Rh D BG status among female secondary school students in Ikorodu, Lagos, to assess the risk and burden of alloimmunisation and to determine the distribution of the Rh D antigen in this population.

2. MATERIALS AND METHODS

2.1 Study Design

The study was a descriptive cross sectional survey of 927 female secondary school students in Ikorodu Local Government Area of Lagos State, South West Nigeria. Ikorodu is located along the Lagos Lagoon (6°36'N 3°30'E / 6.600°N 3.500°E) and shares a boundary with Ogun State, Nigeria. It has a land mass of 152 m² (394 km²). As of the 2006 Census, Ikorodu had an enumerated population of 535,619. There are 12 public secondary schools in Ikorodu and numerous private secondary schools. Four private and 4 public secondary schools were selected by random sampling technique. A proportionate sample size was selected from each school. A total of 927 participants were recruited into the study. The study protocol was communicated to the parents/guardians and informed consent obtained. A written informed consent was obtained from each participating pupil and assent from pupils in paediatric age group. Permission to conduct the study was obtained from the Lagos State Ministry of Health and the involved school authorities.

Ethical clearance was gotten from LUTH Health Research Ethics Committee prior to the conduct of the study.

2.2 Data Collection

Each participant was interviewed using a structured questionnaire to obtain relevant bio-data such as age at menarche, awareness and knowledge of own BG status, risk factors for alloimmunisation. About 5 milliliters (ml) of venous blood was then collected from each participant and tested for Rh D antigen. Rh D negative samples were subsequently subjected to allo-antibody (Anti-D) testing using standard protocols. All sera were separated and stored for a maximum length of 14 days at 2 – 6°C during the course of the study.

2.3 Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences, version 16, Chicago, USA. Results were presented in frequencies and tables.

3. RESULTS

The mean age of the respondents was 15.3 years. Sixty one percent (61%) of the respondents were of Yoruba tribe (Table 1). Forty one percent (41%) of the students were in senior secondary school (SSS) class 1, while the least proportion (3.5%) of the respondents were in junior secondary school (JSS) class 1.

Most of the participants (86.7%) had attained menarche as at the time of the study. The mean age at menarche as reported by the students was 12.6 years. About 4% of the students were sexually experienced. Fifty three students (5.7%) had known risk factors for Rh D alloimmunisation. Twelve students (1.3%) have had previous pregnancy, 41 (4.4%) have a history of previous blood transfusions (Table 2).

Regarding knowledge of Rh blood group system, about 7.3% have heard about Rh blood group system (Table 3). Only about 122 (13.2%) knew their own Rh blood group and 106 (86.9%) were confirmed to be correct after their Rh typing was done. Of those who knew their own Rh blood group status, about 6.7% of the participants described Rh blood group as an independent system, while 6.5% described the Rh blood group as a part of ABO antigen system.

About 96.7% of the participants were Rh D positive. None of the Rh D negative female students was allo-immunised (Table 4).

4. DISCUSSION

Seven percent of the female students who participated in index study have heard about Rh (rhesus) blood group system. When asked about their knowledge of own Rh D status, only 13.2% of the participants had any idea. Some (6.7%) reported ABO antigens as part of their Rh D status, while others (6.5%) reported only their Rh

D status. Only 106 (11.4%) were correct about their Rh D antigen status. This observation suggests a low level of knowledge regarding Rh D antigen among the students. Most of them (92.7%) never heard about Rh D antigen. Some confused ABO and Rh D antigen systems. This observation may be related to a low level of sensitization/ public education among the students, and possibly a lack of pre-school health screening/medical examinations. Also, there is paucity of baseline data regarding public awareness/knowledge about ABO/Rh D blood group systems in Lagos, Nigeria.

Table 1. Socio-demographic distribution of the study participants

Variables	Frequency (n)	Percentage (%)
Age (years)		
10 – 14	369	39.8
15 – 19	520	56.1
20 – 24	38	4.1
Mean±SD = 15.3±2.1, Median = 15, Min = 12, Max = 22		
Tribe		
Yoruba	564	60.8
Ibo	299	32.3
Hausa	56	6.0
Others	8	0.9
School class		
JSS 1	32	3.5
JSS 2	136	14.7
JSS 3	115	12.4
SSS 1	377	40.7
SSS 2	146	15.8
SSS 3	121	13.1
<i>N = 927 (100%)</i>		

Table 2. Other bio-characteristics of the participants

Variables	Frequency (n)	Percentage (%)
Menarche (years)		
Attained	804	86.7
Not attained	123	13.3
Mean±SD age at menarche = 12.6±1.2; Min = 9, Max = 17		
Coitarche		
Naïve	892	96.2
Experienced	35	3.8
Risk factors for alloimmunisation		
Pregnancy	12	1.3
Miscarriage	2	0.2
Induced Abortion*	5	0.5
Parturition	1	0.1
Declined information on pregnancy outcome	4	0.4
Blood Transfusion	41	4.4
No Known risk	874	94.3

*N = 927 (100%) * 41.7% of students with a history of pregnancy has had an induced abortion*

Table 3. Knowledge of own Rh blood group

Variables		Frequency (n)	Percentage (%)
Awareness of Rh blood group	Yes	68	7.3
	No	859	92.7
Knowledge of own Rh blood group			
	As part of ABO system		
	Yes	60	6.5
	No	867	93.5
As an independent entity			
	Yes	62	6.7
	No	865	93.3
Accuracy of knowledge of own Rh blood group*			
	Correct	106	86.9
	Wrong	16	13.1

*N = 927 (100%), *Accuracy of knowledge among 122 self-reported Rh D status*

Table 4. Distribution of Rh D blood group and prevalence of alloimmunization

Variables		Frequency (n)	Percentage (%)
Rh D status			
	D positive	896	96.7
	D negative	31	3.3
Rh D alloimmunization status*			
	Negative	31	100
	Positive	-	-

*N = 927 (100%), *Only 31 Rh D negative participants*

Individual knowledge of own blood group antigen status has significant health benefits. For example in an emergency situation such as road traffic accident, the ability of a victim to volunteer appropriate information regarding blood group antigen status, coupled with requisite laboratory testing facilitates provision of safe blood [4,7]. Also in women of child bearing age, knowledge of Rh D antigen status of the mother is crucial to planning intervention for prevention of potentially fatal complications of alloimmunisation such as haemolytic disease of the foetus and the newborn [27]. Rh D alloimmunisation is associated with severe haemolytic disease of the foetus and newborn.

In index study, most of the participants (87%) had attained menarche. The mean menarche age in this study was 12.6 ± 1.2 yrs which is comparable with many other studies in Nigeria [28-31]. Four (4) percent were sexually experienced and 1.3% have had previous pregnancies. Though the prevalence of sexual activity in this study is much lower than those reported in order studies in Nigeria, the rate of induced abortion is however high (41.7%) [23-26]. These observations further suggests a need for interventional programmes to raise

awareness among secondary school females regarding Rh D antigen.

Blood transfusion is also a known risk factor for red cell alloimmunisation as a result of potential antigen mismatch between blood donor and recipient. In the index study, 4.4% of the students have had at least one previous episode of blood transfusion and hence are at risk of alloimmunisation.

Following blood grouping, 3.3% of the female students were observed to be Rh D antigen negative. This observation can be compared to findings from other parts of Nigeria. Prevalence of Rh D negativity in the general population in Nigeria varies between 1.2% and 6.12% [10-20].

None of the 31 Rh D negative females who participated in the study tested positive for Anti-D allo-antibody screening. However, these Rh D negative females had no history of exposure to risk factors such as pregnancy or blood transfusion. A larger study is needed to estimate the burden of Rh D alloimmunisation among female secondary students in Lagos and its predisposing factors.

5. CONCLUSION AND RECOMMENDATIONS

The level of awareness/knowledge regarding Rh D antigen among female secondary school students in Ikorodu, Lagos was observed to be low. Significant risk factors for Rh D sensitization such as pregnancy and blood transfusion were observed in the study participants however none of them was alloimmunised.

Awareness of Rh blood group system, particularly the Rh D antigen should be raised among secondary school females through a carefully designed health education programmes. Introduction of relevant health topics such as this into school curricula should be considered. ABO/Rh D Blood type among others should be a part of pre-school medical examination at both primary and secondary school levels. Results of such examinations should be communicated to the parents, guardians and students by relevant school health authorities. Doctors should communicate results of ABO/Rh D blood type to their patients and clients always.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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