

## KNOWLEDGE OF RHESUS INCOMPATIBILITY AND ITS PREVENTIVE MEASURES AMONG STUDENTS OF COLLEGE OF HEALTH SCIENCES, OKOFIA

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### Author's contributions

This study was a collaborative effort of the authors. The authors reviewed and approved the final version of the manuscript for publication.

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### ABSTRACT

Rhesus incompatibility is one of the less commonly discussed pregnancy complications in Africa with the rhesus negative prevalence ranging from 2.4% to 4.5%, less than the 14% found among the Caucasians. However, rhesus negative African women face higher reproductive risk such as Hemolytic Disease of Newborn, in comparison to their counterparts. This study aimed to assess the knowledge of rhesus incompatibility and its preventive measures among undergraduate students in the health sector. A descriptive cross-sectional study among 255 students was carried out, with self-administered questionnaires used for data collection and analysis done using Statistical Package for the Social Sciences version 25. Results showed that 76.5%, 17.3% and 6.2% of the students had good, fair and poor knowledge on rhesus incompatibility respectively. Only 42.4% had good knowledge on preventive measures. Inclusion of the subject in academic curriculum was the major factor affecting knowledge. Others were personal experiences then culture and beliefs (16.1% and 21.6%). There was a statistically significant relationship between level of knowledge of rhesus incompatibility and knowledge of its preventive measures ( $P < 0.001$ ). In conclusion, students in the health sector have adequate knowledge of rhesus incompatibility but need more training to be well versed in the preventive measures.

**Keywords:** Knowledge, Preventive measures, Rhesus incompatibility, Students

### INTRODUCTION

According to Landsteiner and Weiner's 1940 description, the rhesus blood group system (Rh) is the second most significant blood group system, following ABO, where the presence or absence of the rhesus D antigen on an individual's red blood cells denotes rhesus positive and negative status respectively. Rhesus incompatibility describes the mismatched rhesus types of the mother and the fetus. Rhesus incompatibility is linked to the onset of maternal rhesus sensitization and neonatal hemolytic illness otherwise known as hemolytic disease of the newborn (HDN) (Costumbrado *et al.*, 2022). Unlike the ABO system, individuals who possess D-negative red blood cells typically do not have anti-rhesus antibodies in their blood unless they have had exposure to D-positive red blood cells through their circulatory system (Ajayi *et al.*, 2022). If a rhesus-negative mother is exposed to the D

antigen, she develops anti-D IgG antibodies, which can cross the placenta, attach to and possibly destroy rhesus positive fetal erythrocytes (Costumbrado *et al.*, 2022). This event is called alloimmunization or more commonly, a sensitizing event and can occur due to fetal-maternal hemorrhage occurring in pregnancy particularly after 28 weeks of gestation. Causes of such hemorrhage includes invasive antenatal procedures, termination of pregnancies, abdominal trauma, treatment to the fetus, external cephalic version, intrauterine fetal death and during delivery. Sensitizing events can also occur outside pregnancy because of exposure to Rh-positive blood through transfusion (Bennardello *et al.*, 2015; Costumbrado *et al.*, 2022; Peixoto & de Jesús, 2021). This is of clinical significance because the likely sequel for the rhesus positive fetus is Hemolytic Disease of Newborn (HDN). HDN can lead to a variety of effects, from severe hydrops to self-limited hemolytic anemia. The severity of illness depends greatly on the number of immunoglobulins, the gestational age, and the enzymatic activity of the fetus (Costumbrado *et al.*, 2022; Sarwar & Sridhar, 2024). Anti-D Ig is used as prophylaxis against Rh immunization for expectant Rh-negative mothers who have been sensitized or have been pregnant for a Rh-positive offspring (Mitra *et al.*, 2014). Irrespective, the goal of the health practitioner must be to prevent sensitizing events from occurring and when they do, to set up measures for the early mitigation of the consequences. One way to do this is ensuring that health practitioners in training are not just aware of rhesus incompatibility but also the preventive measures (Aliyo *et al.*, 2023). These measures include administration of rhesus immunoglobulin (anti-D) prophylaxis for previously non-sensitized rhesus negative pregnant women immediately after delivery and during pregnancy in instances of potentially sensitizing events (Bhutani *et al.*, 2013; Erhabor *et al.*, 2021). In addition, non-invasive prenatal rhesus screening should be carried out for pregnancies with particular risk (Bhutani *et al.*, 2013). Other measures like proper blood screening, screening and matching of rhesus negative platelets to women or if unavailable, administration of rhesus D immunoglobulin after platelet transfusion are also recommended (Erhabor *et al.*, 2021). Worldwide, the prevalence of rhesus negative blood type varies significantly, occurring in approximately 14% of caucasians compared with 2.4% – 4.5% among sub-saharan African populations (Opara, 2023). In Nigeria, the overall prevalence is about 5.1%, with regional variations ranging from 3.1–3.9% in the north, 4.3% in the southwest, 4.4% and 6.0% in the south-east and south-south respectively (Erhabor *et al.*, 2021). Despite a lower prevalence of rhesus negativity in developing regions, hemolytic disease of the fetus and newborn (HDFN) due to Rhesus incompatibility remains a public health concern. In 2010, the global estimate of infants affected by hemolytic disease secondary to rhesus incompatibility was 373,300 with a prevalence of 276/100,000 live births. While developed countries report markedly lower rates (2.5 per 100,000 live births) due to advanced preventive care, higher burdens persist across Southeast Asia/Pacific, Latin America, North Africa/Middle East, South Asia, sub-Saharan Africa, and Eastern Europe/Central Asia (Bhutani *et al.*, 2013). In Nigeria, the prevalence of Rhesus D-related HDFN ranges from 2.5% to 11.3% (Otomewo *et al.*, 2020). This could be due to inadequate use of prenatal anti-D prophylaxis and other anti-D HDN related preventative measures in developing countries like Nigeria (Erhabor *et al.*, 2021; Opara, 2023).

Despite advances in modern medicine, there is still a knowledge deficit on rhesus incompatibility not just among the general population but also among health professionals and students in the medical field. In a cross-sectional study done among first year health students in Saudi, majority of students who were rhesus positive reported their Rh group correctly. For the rhesus negative students, 59.8% of students had a good knowledge about their Rh type. Additionally, 87% of the male students had good knowledge about rhesus blood groups which was higher than their female counterparts (76.0%). Lastly, students who had a previous history of blood donation had a higher proportion of good knowledge about their ABO and Rh blood groups compared with those who had not (90.9% and 93.9% vs 81.4% and 80.2%, respectively) (AlShamlan *et al.*, 2021). In southwest Nigeria, 200 university students in Ilorin were interviewed; 19.5%, 41.0% and 39.5% had a high, moderate, and low level of knowledge on rhesus factor incompatibility (Oyeyemi *et al.*, 2022). In another study done in the north-western region of Nigeria, among college of education students, about 119 (59.5%) of the participants had not heard about blood groups, and 171 (85.5%) lacked knowledge on rhesus factor. This study revealed a knowledge gap about Rhesus factor and other blood related conditions amongst Federal College of Education Katsina students (Mashi *et al.*, 2023). In Kano state, A descriptive cross-sectional study among primary health care workers was carried out to assess knowledge of rhesus and its management. The results showed that out of the 424 respondents, a good proportion (62.3%) had

good knowledge of rhesus negative pregnancy but only 6% knew about good management and prophylactic practices (Gajida *et al.*, 2020). Some factors affecting the knowledge of rhesus incompatibility and its preventive measures are traditional beliefs and harmful misconceptions concerning the disease and its presentation. This includes the belief that hemolytic disease of the newborn and stillbirth from this disease may be the will of God, a curse, etc. This has contributed to the lack of awareness, poor reporting and consequently insufficiency of data on the topic (Allahdadian & Irajpour, 2015; Itaa & Willy, 2024). Therefore, it is necessary to increase the knowledge of doctors, laboratory scientists, midwives, nurses, and other healthcare professionals in Nigeria and Africa on anti-D prophylaxis and the management of rhesus negative pregnant women. This will make it easier to provide high-quality prenatal and postnatal care for this population (Erhabor *et al.*, 2021). This highlights the need for further research to assess the knowledge on rhesus incompatibility and its prevention, not just on pregnant women as most research has thus far focused on, but also students who will soon become health professionals. This would help identify the knowledge gap if any and develop strategies to combat the problem at the grassroots. This study also explored factors affecting knowledge of rhesus incompatibility and suggest possible strategies that will help bridge any existing gap. This study aims to determine the level of knowledge of rhesus incompatibility and its preventive measures among students of College of Health Sciences Okofia, to assess their attitude, and the factors that influence their knowledge of rhesus incompatibility and its preventive measures.

## **METHODOLOGY**

### **Study Area**

This study was conducted in the College of Health Sciences, Okofia. The college is a branch of Nnamdi Azikiwe University located in Anambra State Nigeria. Nnamdi Azikiwe University (NAU) is a federal university, established in 1992 and named after the first President of Nigeria. The College of Health Sciences is found in Okofia, a village in Nnewi. It is made up of three faculties which include the faculty of Basic Medical Sciences, the Faculty of Health Sciences and Technology, and the Faculty of Medicine. The college is populated by students in various departments including the department of anatomy, physiology, medicine, nursing science, medical rehabilitation, medical laboratory science, radiography and environmental health science. The college also has a teaching hospital, the Nnamdi Azikiwe University Teaching Hospital (NAUTH), which provides clinical training and healthcare services to the surrounding communities.

### **Study Design**

This study was a descriptive cross-sectional study of the students of College of Health Sciences, Okofia, Nnamdi Azikiwe University.

### **Study Population**

Undergraduate students from the faculties of Basic Medical Sciences, Health Science and Technology and Medical Laboratory Science in the College of Health Sciences Okofia.

### **Inclusion Criteria**

Consenting undergraduate students from the above-mentioned faculties in their 2nd to final year of study.

### **Exclusion Criteria**

1. Students who were absent from school on data collection days.
2. Students with mental disabilities.

### **Sample Size Determination**

Sample size was determined from a prevalence rate of 19.5% that was obtained from a previous study done in Nigeria (Oyeyemi *et al.*, 2022).

The sample size was then determined using Kish Leslie's formula with a prevalence value of 0.195

$$n = (Z^2pq)/d^2$$

Where n = minimum sample size with population >10,000

z = standard normal deviation usually 95% i.e., 1.96

$$p = 0.195$$

$$q = 1 - p = 0.805$$

d = degree of precision (0.05)

$$n = (1.96^2 \times p \times q)/d^2$$

$$n = (1.96^2 \times 0.195 \times 0.805)/0.05^2 = 241.21$$

$$nf = n / [1+(n/N)]$$

nf (desired sample size when the population is less than 10,000)

N = Population size of 5,099

$$nf = 241 / [1+(241/5099)]$$

$$nf = 230$$

Anticipating a non-response rate of 10%,

$$nf / 1-f = 230 / 1 - 0.1 = 230 / 0.9 = 255.55$$

The final sample size was 256.

### Sampling Technique

Multistage sampling technique was used in selecting students consisting of stratified sampling followed by simple random sampling.

### Study Instruments

The study instrument comprised a semi-structured self-administered questionnaire adopted and adapted from Ojo and Osuntusa (2021), Oyeyemi *et al.* (2022); however, reliability testing was not conducted prior to data collection.

### Statistical Analysis

The collected data was cleaned and analyzed using the International Business Machines-Statistical Package for Social Sciences (IBM-SPSS) version 25.

### Measurement of Variables

The questionnaire section on knowledge of rhesus factor incompatibility had 9 questions and every correct answer earned one score. The maximum and minimum scores were 9 and 0 respectively. Students with scores between 0 and 3; 4 and 6; and 7 and 9 were classified as having poor, fair, or good knowledge of rhesus factor incompatibility. Assessment of knowledge of the preventive measures for rhesus incompatibility was carried out based on 5 preventive measures with the lowest score being 0 and highest 5. Students with scores between 0-1, 2-3 and 4-5 were classified as having poor, fair and good knowledge on the preventive measures respectively. Attitude to knowledge of rhesus incompatibility and its preventive measures was assessed by 6 five-level Likert scale questions. Strongly agree was scored 5 points and strongly disagree, 1. The maximum score obtainable was 30 while minimum score was 5 points. The total was classified into 2 categories in which 5- 17 indicated negative attitude and 18-30 signified positive attitude towards rhesus incompatibility and its preventive measures.

### Ethical Considerations

Ethical approval for this study was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics Committee (NAUTHEC) through the head of the Department of Community Medicine, Nnamdi Azikiwe University with reference number NAUTH/CS/66/VOL.16/VER.3/172/2024/124

Informed consent was obtained from the respondents.

## RESULT

A total of 260 questionnaires were administered to students across the various faculties. 255 questionnaires were retrieved giving a response rate of 98.6%.

Table 1: Sociodemographic characteristics of respondents

VARIABLE	FREQUENCY (n=255)	PERCENTAGE
<b>AGE</b>		
16-20	47	18.4
21-25	182	71.4
26-29	21	8.2
30-34	4	1.6
35+	1	0.4
Mean age; Std deviation	21.46±2.615	
<b>GENDER</b>		
Female	141	55.3
Male	114	44.7
<b>MARITAL STATUS</b>		
Married	2	0.8
Single	253	99.2
<b>RELIGION</b>		
Christianity	250	98.0
Islam	1	0.4
None	2	0.8
Traditional	2	0.8
<b>DEPARTMENTAL LEVEL</b>		
200 LEVEL	68	26.7
300 LEVEL	92	36.1

400 LEVEL	58	22.7
500 LEVEL	37	14.5
<b>FACULTIES</b>		
Medical Laboratory Science	38	14.9
Basic Medical Sciences	77	30.2
Health Sciences	140	54.9
Total	255	100

Table 1 shows the sociodemographic characteristics of the respondents.

The study involved adults with a mean age of  $21.46 \pm 2.615$  years.

Table 2: Knowledge of rhesus incompatibility among students of College of Health Sciences, Okofia.

VARIABLES	FREQUENCY	PERCENTAGE (%)
1. Heard of rhesus incompatibility		
Yes	220	86.3
No	35	13.7
2. Rhesus factor is an antigen found on the red blood cells of most people		
Yes	244	95.6
No	11	4.3
3. If I have the antigen, I am rhesus positive if I do not have the antigen, I am rhesus negative		
Yes	191	74.9
No	64	25.1
4. I know my own blood group and rhesus factor		
Yes	208	81.6
No	47	18.4
5. I am aware that rhesus incompatibility occurs when a woman with Rh-negative blood type is exposed to Rh-positive blood		

cells, leading to the development of Rh antibodies		
Yes	236	92.5
No	19	7.5
Total	255	100.0
6. Rhesus incompatibility can occur when a rhesus negative woman marries a rhesus positive man		
Yes	214	83.9
No	41	16.1
7. I know about the consequence of rhesus incompatibility on fetus/newborn		
Yes	229	89.8
No	26	10.2
8. Aware of preventive measures or treatments available to manage Rh factor incompatibility during pregnancy		
Yes	191	74.9
No	64	25.1
9. I am confident in my knowledge and understanding of rhesus incompatibility as a medical student		
Yes	143	56.1
No	112	43.9
GOOD KNOWLEDGE	195	76.5
FAIR KNOWLEDGE	44	17.3
POOR KNOWLEDGE	16	6.2
TOTAL	255	100.0

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Table 3: Knowledge of preventive measures among students of College Of Health Sciences, Okofia.

VARIABLES	FREQUENCY	PERCENTAGE (%)
Awareness creation campaign on the topic		
Yes	175	68.7
No	80	31.3
Total	255	100
Screening for Rhesus factor of couples before marriage		
Yes	202	79.2
No	53	20.8
Total	255	100
Careful grouping and cross matching of blood before transfusion		
Yes	99	38.8
No	156	61.2
Total	255	100
Administration of Rhogam within 72 hours after delivery		
Yes	108	42.4
No	147	57.6
Total	255	100
Administration of Rhogam during pregnancy at specific times or after sensitizing events		
Yes	51	20
No	204	80
TOTAL	255	100
GOOD KNOWLEDGE	108	42.4
MODERATE KNOWLEDGE	71	27.8
POOR KNOWLEDGE	76	29.8
TOTAL	255	100

Majority of the respondents knew that awareness creation campaigns (68.7%) and premarital blood screening (79.2%) were measures to prevent rhesus incompatibility. However, only 38.8% knew about careful grouping and cross matching of blood before transfusion, 42.4% knew about Rhogam administration within 72 hours of delivery and only 20% knew of administration of Rhogam during sensitizing events in pregnancy.

### **FACTORS INFLUENCING KNOWLEDGE OF RHESUS INCOMPATIBILITY AND ITS PREVENTIVE MEASURES**

74.5% and 48.6% of students considered academic curriculum/discussions and formal classroom lectures as factors influencing their knowledge of the subject. 16.1% of students had personal experience with rhesus incompatibility and 21.6% agreed that culture and beliefs played a significant role in their knowledge.

### **ATTITUDE**

The majority (94.5%) had a positive attitude while 5.5% had a negative attitude.

The chi-square test was conducted to examine the relationship between 'knowledge of rhesus incompatibility' and 'knowledge of preventive measures'. Given that the p-value of 0.000 was less than the alpha level of 0.05, we rejected the null hypothesis and concluded that there was a statistically significant relationship between knowledge of rhesus incompatibility and knowledge of the preventive measures among college of health science students, Okofia.

### **DISCUSSION**

In this cross-sectional descriptive study, the age of the respondents ranged from 16 to 35 and above with majority falling between 21-25 years with a mean age of 21.46. This was expected as the study population was university students. 99.2% of the students were single and 55% were females. These sociodemographic characteristics are similar to that of other studies carried out among students (Khan *et al.*, 2022; Bennardello *et al.*, 2015). The implication of these demographic factors of unmarried young adults, is that they represent a subset of the nation's population who will eventually be faced with the reproductive implications of rhesus incompatibility when they get married and start childbearing. There was good knowledge (76.5%) of rhesus incompatibility in this study population which was similar to the findings in Saudi (AlShamlan *et al.*, 2021). The results of the study are to be expected as the respondents were all studying health related courses and may have been exposed to such information. The knowledge of rhesus incompatibility was however significantly more than that found among secondary school female students in Ikorodu, Lagos (Ogbenna *et al.*, 2016). This could be accounted for by difference in age and educational qualifications among the respondents. However, there was a noticeable gap in the knowledge of preventive measures as barely half of the respondents had good knowledge of rhesus incompatibility preventive measures. This showed that knowledge of rhesus incompatibility does not automatically translate to knowledge of its preventive measures. This could be accounted for by the fact that most of the students were in their 2nd and 3rd year of study and may not yet be exposed to more technical information on the subject.

Factors influencing the knowledge of rhesus incompatibility and its preventive measures were assessed and the most important factor amongst students at the college was their curriculum/ academic discussions followed by formal classroom education. This shows the importance of formal education in improving the knowledge of this issue. This also accounts for the gap in knowledge seen between this study and those carried out among women with lower educational qualifications (Itaa & Willy, 2024). Sadly, 16% of the respondents had personal experience of rhesus incompatibility and its complications which influenced their knowledge on the subject while 21.6% were influenced by culture and belief system. It implies that there is a need for public awareness campaigns to ensure that both the educated and uneducated are not left out in fighting against rhesus incompatibility. The findings of this study were a bit like that of pregnant women in Port Harcourt where cultural and religious beliefs had a significant influence of up to 30% of the respondent's knowledge and attitude toward rhesus incompatibility (Itaa &

Willy, 2024). Finally, there was a statistically significant relationship between the levels of knowledge of rhesus incompatibility and the level of knowledge of preventive measures for rhesus incompatibility and this corroborates with studies done in Port Harcourt (Itaa & Willy, 2024). This association is expected and it means that improving the knowledge of rhesus incompatibility among health students will consequently lead to a rise in the level of knowledge of the preventive measures that can be implemented in our society. This is important in public health as it will mean a decline in the reproductive consequences of rhesus incompatibility.

## CONCLUSION

The study carried out among health students showed good understanding of rhesus incompatibility; however, knowledge of its preventive measures was only moderate, indicating a gap in their comprehensive understanding of the topic that may affect future clinical practice. This gap reflects a need for greater emphasis on the preventive strategies available. Based on these findings, students in various medical fields should receive further training on preventive measures through clinical exposure, seminars, and case reports as this will improve their ability to educate the public. In addition, government agencies, non-governmental organizations, and healthcare professionals should carry out public awareness programs on rhesus incompatibility. Further research is also recommended to explore the influence of cultural beliefs, background, and personal experiences on knowledge and attitudes toward rhesus incompatibility to address existing misconceptions.

## Limitations

The study was a cross-sectional study limiting its ability to establish a casual relationship between variables. Data was obtained through self-reported responses which may be subject to self-report bias. Additionally, the study was conducted in a single institution, which may limit the generalizability of the findings to other settings or populations.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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