

## **REVIEW ON KNOWLEDGE OF ISSUES OF RHESUS INCOMPATIBILITY AMONG NIGERIANS**

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### **Abstract**

The paper reviewed issues related to knowledge of Rhesus incompatibility in Nigeria. It frowned that despite relatively high prevalence rate of Rhesus incompatibility among the public in Nigeria, yet knowledge about it remains very low. The Health Belief Model was adopted as the theoretical framework. However, low level of knowledge of Rhesus incompatibility among Nigerians is associated with factors like poverty, lack of access to maternal healthcare, ignorance and religious beliefs. The role of these factors compounds the high prevalence of Rhesus incompatibility in Nigeria in comparison with other countries. The paper thus recommends that Rhesus compatibility testing be made compulsory before marriage and during pregnancy. The public should be adequately sensitized about Rh incompatibility while access to healthcare should be made more affordable by encouraging health insurance in the country.

**Keywords:** Rhesus Incompatibility, Rh Factor, Blood Group, Prevalence, Knowledge

### **Introduction**

The Rh factor was named after the monkeys in which it was first discovered (Salem and Singer, 2011). The antigen and hereditary protein known as Rhesus factor is located on the surface of red blood cells. Red blood cells with the antigen are referred to as Rh positive (Rh+), while those lacking the antigen are referred to as Rh negative (Rh-) (Scott & Ricci, 2018). Historically, following the description of the A, B, O blood types, a fourth, the Rhesus system was discovered by Landsteiner and Weiner in 1940 (Farhud and Zarif, 2020). This followed experiments which made use of Rhesus monkeys, hence the statuses of Rhesus Positive or Rhesus negative depending on the presence or absence of the antigen respectively on the red blood cells of a person (Avent, Neil, Reid and Marion, 2020). The most typical blood type is rhesus positive. A Rh negative blood type is not a disease and typically has no impact on one's health. However, it could be a significant problem for incompatible couples, particularly during pregnancy. For instance, a pregnancy needs special attention if the mother is Rh negative and the baby is Rh positive. This indicates Rh incompatibility (Scott & Ricci, 2018). Rhesus incompatibility is a condition that occurs during pregnancy if a woman has Rh negative blood and her baby has Rh positive blood. Much of high infant mortality is related to problems from pregnancy and early infancy such as maternal-fetal blood incompatibility (Kio, et al, 2016).

The WHO (2016) states that rhesus incompatibility has varying prevalence and complications around the world, and that the low incidence of rhesus negativity frequently results in the neglect of incompatibility. The distribution of RhD-negative varies widely; while a prevalence of greater than 14% is recorded among the Caucasians (Zipursky and Paul, 2011), the prevalence among the different ethnic groups of the sub-Saharan Africa ranges between 2.4-4.5% (Tragny, Fongué and Mbanya, 2009). The distribution also varies in the different regions of the same country; for instance, a prevalence of 0.7% is being reported among the pregnant population from the north central region of Nigeria, (Omotade, Adeyemo, Kayode, Falade, Ikpeme, 1999) whereas, a prevalence of 5% is being reported among the pregnant women from southwestern region of the same country (Onwuhafua and Adze, 2004). The reproductive risk for rhesus negative African women is three times higher than for non-African women, indicating a problem that needs to be investigated. Despite the fact that Rh Incompatibility is

inexpensive and simple to test, relatively little is known about it and the complications it might cause during pregnancy and after childbirth especially among rural dwellers in Nigeria.

There is lack of basic knowledge about blood types, much less their rhesus factor, and as a result people are uninformed about the risks that rhesus incompatibility can present to women that have been pregnant before, pregnant women and their unborn children. Although Rhesus immunoglobulin was introduced in 1968, haemolytic diseases of the newborn pose a serious concern, and ignorance about them is higher due to inadequate educational programs. According to the World Health Organization (2016), neonatal mortality is responsible for about 46% of deaths of children under the age of 5, and a large amount of it is caused by problems like rhesus incompatibility. Factors that influence a rhesus negative pregnant female's chances of developing rhesus incompatibility include the following: ectopic pregnancy, Placenta previa, placental abruption, abdominal/pelvic trauma, In utero fetal death, spontaneous abortion or any invasive obstetric procedure like amniocentesis (leon etal, 2014). Spontaneous abortion among women who have no knowledge of the Rh compatibility between them and the person they got pregnant for has been found to be the biggest factor in failed attempts to conceive subsequently or carry a pregnancy to full term without complications and miscarriages (Ogbenna, 2016).

The amount of fetal blood necessary to produce rhesus incompatibility varies. In one study (Thorp etal, 2008), less than one milliliter of rhesus positive blood was shown to sensitize volunteers with rhesus negative blood. Conversely, other studies (Trem, 2010; Madie and Brent, 2015) have suggested that 30% of persons with rhesus negative blood never develop rhesus incompatibility, even when challenged with large volumes of 2 rhesus positive blood. Once sensitized, it takes approximately one month for rhesus antibodies in the maternal circulation to equilibrate in the fetal circulation. In 90% of cases, sensitization occurs during delivery. Therefore, most firstborn infants with rhesus-positive blood type are not affected because the short period from first exposure of rhesus-positive fetal erythrocytes to the birth of the infant is insufficient to produce a significant maternal immunoglobulin (IgG) antibody response. (Thorp etal, 2008).

Haemolytic disease of foetus and newborn following allo-immunization to Rh D is a major contributor to perinatal mortality and morbidity, hence impacting on a women's obstetric career. Sensitization, anti D antibody formation and the sequale of Haemolytic disease of fetus and newborn can be prevented by the administration of anti-D immunoglobulin G (IgG) prophylaxis soon after delivery in Rhesus negative women and is recommended by the World Health organization (WHO)

This paper will assess the knowledge of Rhesus factor incompatibility in Nigeria while suggesting measures to improve

## **Literature Review**

### **The concept of Rhesus Incompatibility**

Costumbrado, Mansour and Ghassemzadeh (2021) describes Rhesus (Rh) incompatibility as the discordant pairing of maternal and fetal Rh types. It is associated with the development of maternal Rh sensitization and hemolytic disease of the neonate (HDN). An individual can be classified as Rh-positive if their erythrocytes express the Rh D antigen; individuals without the Rh D antigen are classified as Rh-negative. This phenomenon becomes clinically significant if a mother that is Rh-negative becomes sensitized to the D antigen and subsequently, produces anti-D antibodies (i.e., alloimmunization) that can bind to and potentially lead to the destruction of Rh-positive erythrocytes. This is of particular concern if an Rh-negative mother is carrying an Rh-positive fetus, which can result in consequences along the spectrum of HDN ranging

from self-limited hemolytic anemia to severe hydrops fetalis. This activity reviews the etiology, evaluation, and management of Rh incompatibility, and highlights the role of the inter-professional team in caring for at-risk patients.

While Rh incompatibility does not typically lead to clinical signs and symptoms in the Rh-negative mother, the consequences on the Rh-positive fetus can be substantial. While the topic of HDN is one that will be discussed elsewhere, some clinical features of HDN secondary to Rh incompatibility include lethargy, pallor, jaundice, scleral icterus, tachycardia, tachypnea, and hypotension. Hydrops fetalis is severe, life-threatening hemolytic anemia (that presents with at least two of the following: edema, pericardial effusions, pleural effusions, ascites) and is associated with a significant mortality rate estimated to be more than 50% (Hendrickson, Delaney and Hemolytic, 2016).

Race and Sanger (2005) reported that when an RhD negative mother is exposed to the RhD positive red cells (usually as transplacental haemorrhage), the client develops allo-anti-D which cross the placenta and results in the destruction of fetal red cells. The clinical manifestations of RhD hemolytic disease range from asymptomatic mild anemia to hydropsfetalis or stillbirth associated with severe anemia and jaundice. Furthermore, it was observed that hemolytic disease of newborn was a significant cause of fetal mortality and morbidity until the introduction of amniocentesis, intrauterine transfusion, and exchange transfusion in the management of severely allo-immunised women and their fetuses.

The Rh blood group system is clinically the most important of the protein antigens, and remains the commonest cause of haemolytic disease of the newborn (HDN). The antigens are exclusively found on the red cells antigen. The antibodies directed to the antigens are primarily Immunoglobulin G (Ig-G), and rarely fixed complements; the antibody response may either be primary or secondary. The Rh antigens consist of a family of inherited antigens of which Race and Fisher<sup>1</sup> earlier proposed three pairs: Dd, Cc, Ee. It is now known that the Rh blood group comprise of more than 45 individual antigens<sup>2</sup> of which five are routinely identified: D, C, c, E and e. The absence of the D antigen denotes Rh negativity.

Rh iso-immunization still contributes to the neonatal morbidity and mortality in the world due to non-immunization, under-immunization, and false Rh typing in rare cases (Holburn and Prior, 2006). When maternal sensitization to the D antigen is present, it is important to establish the paternal zygosity (Holburn and Prior, 2006). It was reported that in the white population, the incidence of heterozygosity for the D antigen is 56% (Race and Sanger, 2005). In such cases of paternal heterozygosity, only 50% of the fetuses will be potentially at risk for iso-immunization. Therefore, by establishing the paternal zygosity, improved counseling of couples concerning risks and treatment options can be provided. Furthermore, if paternal homozygosity is confirmed, the need for invasive procedures to diagnose fetal blood type may be obviated (Holburn and Prior 2006). Fetal-maternal hemorrhage exposes the mother to foreign red cell antigens, which can lead to an immune response in the mother. Previous maternal transfusion can also lead to the development of subsequent hemolytic disease of the newborn. Although more than 60 antigens can cause hemolytic disease of newborn, the most common cause is Rh sensitization (Holburn and Prior 2006). Hemolytic disease of the newborn can also be caused by less common atypical antibodies, which can cross the placenta and affect the fetus in a similar fashion (Berkowitz, Beyth and Sadovsky, 2003). Severe fetal disease due to these atypical antibodies is said to be rare. A combined incidence of severe fetal disease of 0.1% to 2% has been reported (Solola, Sibai, & Mason, 2008).

### **Knowledge and Prevalence of Rh Incompatibility in Nigeria**

Ogbnenna (2016) is of the view that there is low knowledge about Rh compatibility among young girls because sex education is discouraged in Nigerian schools and homes. He argues that this is responsible for the high rate of rhesus incompatibility among teenage girls who give birth as single or unmarried mothers. Knowledge of Rh incompatibility is influenced by education and access to antenatal care. The twin factors of poverty and ignorance play significant roles in the low knowledge among members of the public on Rh incompatibility. The health belief model talks about the place knowledge acquired through various means including education in influencing the actions of people as regards Rh factor. People with good education may have the knowledge of Rh incompatibility and hence, the belief that doing the right thing will keep them and their children safe.

Adeyemi and Bello-Ajao (2016) conducted a study on Prevalence of Rhesus D-negative blood type and the challenges of Rhesus D immunoprophylaxis among obstetric population in Ogbomoso, Southwestern Nigeria and found that of the 596 booked patients attending Ladoko Akintola University of Technology Teaching Hospital Ogbomoso, 33, 5.5% were Rh negative and almost 50% of the Rh negative women were primipara. They also found that only nine, 39.1% of these Rh negative women had the Rh anti-D immunoglobulin following delivery or abortion, the prevalence of Rh negativity remains low and the risk of haemolytic disease of the new-born with its attendant perinatal morbidity and mortality is real in our community.

Okeke, et al (2012) conducted a study on the prevalence of rhesus negativity among pregnant women in Enugu, Southeast Nigeria and this showed that the prevalence of Rh D women in Enugu, Nigeria is 4.5%. It is noted that a significant amount of women could be predisposed to rhesus incompatibility in pregnancy which could cause haemolytic disease of new-borns and other problems in their babies. The prevalence of rhesus negative women to rhesus positive women is about 5-9.5% of the total Nigerian population and because of small amount the issue of rhesus incompatibility is often overlooked or ignored. Some pregnant women, especially primiparous women that have not been sensitized are ignorant of what rhesus factor and incompatibility entails. This is in line with the results of the study conducted by Kio, et al (2016) on expectant mothers' knowledge, attitudes and practices regarding maternal fetal blood incompatibility which reported that the level of knowledge concerning maternal-fetal blood incompatibility of expectant mothers was low (39%). This shows that they are also ignorant of the danger it poses and those that are aware of the importance may not know how to go about the prevention of rhesus incompatibility. Pregnant women's attitude to the different rhesus incompatibility prevention is important in adequate prevention. Kio, et al, (2016) conducted a study assessing expectant mothers' knowledge and practice regarding maternal-fetal blood incompatibility among pregnant women in Olabisi Onabanjo University Teaching Hospital and found that although the respondents exhibited average positive attitude towards incompatibility test (56%) and low negative attitude (38%), about 56% of the women felt the test procedure will be embarrassing. The result showed that pregnant women in the study area did not really see maternal-fetal blood incompatibility as a serious problem which is clearly as a result of the low level of knowledge concerning it (Kio, et al 2016). Indeed, this also amplifies the place of health belief model. Without adequate knowledge of the issues surrounding Rh, people can move into marriage or even become pregnant without proper checks. Again, people may not believe in the existence of Rh incompatibility entirely.

### **Prevalence of Rh Incompatibility in Nigeria**

Because of the possible effects on maternal and neonatal health, the prevalence of Rh incompatibility in Nigeria has drawn attention. The prevalence of this illness in various parts

of the nation has been made clear by a number of research. The frequency of Rh incompatibility among pregnant women visiting a tertiary healthcare facility in Jos, Nigeria, was the subject of a study undertaken by Egesie et al. (2018). The study found a 4.8% overall prevalence in the studied population, which shows that Rh incompatibility is a major problem in the area.

Similar to this, Adewuyi et al. (2017) investigated the prevalence of Rh incompatibility in southwest Nigeria in a multicenter research. The study, which included more than 2,500 expectant mothers, discovered a prevalence rate of 3.6%, indicating Rh incompatibility as a significant health issue in the area. Nkwo et al. (2020) observed a prevalence rate of 5.7% among pregnant women attending prenatal clinics in another study they did in Enugu, Nigeria. This result emphasizes the significant impact of Rh incompatibility in Nigeria, with variations seen across several geographic regions.

Additionally, Okafor et al. (2016) conducted a retrospective study to examine the prevalence of Rh incompatibility among pregnant women in a tertiary hospital in the Nigerian state of Anambra. According to the study, the prevalence rate was 3.2%, highlighting the need for effective treatments to deal with this problem. With rates ranging from 3.2% to 5.7%, these studies combined show a considerable frequency of Rh incompatibility among pregnant women in Nigeria. It is crucial to remember that these research concentrated on particular areas or healthcare facilities, and that prevalence rates may range across the nation. In addition to the aforementioned findings, a number of other academic works (Chigbu & Iloabachie, 2014; Ekeh et al., 2017; Nwogu-Ikojo et al., 2019) support Nigeria's high prevalence of Rh incompatibility. These studies help us understand how widespread Rh incompatibility is in Nigeria and highlight how critical it is to address it in order to enhance maternal and newborn health outcomes. The high prevalence of Rh incompatibility in Nigeria brings to fore the place of health belief model in explaining the topic. The perceived benefits of Rh compatibility appears not to have been properly emphasized or publicized, hence the high prevalence of Rh incompatibility in the country.

In conclusion, numerous research carried out across various locations have shown that the prevalence of Rh incompatibility in Nigeria is a substantial concern. These studies' rates, which vary from 3.2% to 5.7%, show the significant impact this disorder has on maternal and newborn health in the nation.

### **Improving Knowledge of Rh incompatibility in Nigeria**

Rh incompatibility continues to thrive in Nigeria as a result of a combination of factors that has been identified in this study. Odum (2019) suggests that poverty is the major inhibiting factor of knowledge about Rh incompatibility. He argues that the inability to access robust healthcare before, during and after pregnancy by women exposes them to Rh complications. Addressing the problems of poverty which affects access to healthcare will improve the knowledge about Rh incompatibility in Nigeria. In the same vein, ignorance has been identified as a key factor in Rh incompatibility. With a significant rural population that lacks access to regular sources of health information, the Nigerian woman is considered by Adunni (2014) as ignorant by design and not by choice. This form of ignorance affects healthcare choices like Rh compatibility checks. Rh checks are often ignored because of lack of knowledge about its importance/relevance. In some cases, the incompatibility is discovered after irreversible damages has been done. Adunni (2014) submits that there is need to properly educate women especially rural dwellers on the factors surrounding Rh incompatibility.

### **Theoretical Orientation**

The Health Belief Model (HBM) will be adopted as the theoretical framework for the study. The Health Belief Model (HBM) was developed in the early 1950s by social scientists at the U.S. Public Health Service in order to understand the failure of people to adopt disease prevention strategies or screening tests for the early detection of disease. Later uses of HBM were for patients' responses to symptoms and compliance with medical treatments. The HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior.

The HBM was developed with the foundation that the two components of health-related behavior are 1) the desire to avoid illness, or conversely get well if already ill; and, 2) the belief that a specific health action will prevent, or cure, illness. Ultimately, an individual's course of action often depends on the person's perceptions of the benefits and barriers related to health behavior. There are six constructs of the HBM. The first four constructs were developed as the original tenets of the HBM. The last two were added as research about the HBM evolved.

1. Perceived susceptibility - This refers to a person's subjective perception of the risk of acquiring an illness or disease. There is wide variation in a person's feelings of personal vulnerability to an illness or disease.
2. Perceived severity - This refers to a person's feelings on the seriousness of contracting an illness or disease (or leaving the illness or disease untreated). There is wide variation in a person's feelings of severity, and often a person considers the medical consequences (e.g., death, disability) and social consequences (e.g., family life, social relationships) when evaluating the severity.
3. Perceived benefits - This refers to a person's perception of the effectiveness of various actions available to reduce the threat of illness or disease (or to cure illness or disease). The course of action a person takes in preventing (or curing) illness or disease relies on consideration and evaluation of both perceived susceptibility and perceived benefit, such that the person would accept the recommended health action if it was perceived as beneficial.
4. Perceived barriers - This refers to a person's feelings on the obstacles to performing a recommended health action. There is wide variation in a person's feelings of barriers, or impediments, which lead to a cost/benefit analysis. The person weighs the effectiveness of the actions against the perceptions that it may be expensive, dangerous (e.g., side effects), unpleasant (e.g., painful), time-consuming, or inconvenient.
5. Cue to action - This is the stimulus needed to trigger the decision-making process to accept a recommended health action. These cues can be internal (e.g., chest pains, wheezing, etc.) or external (e.g., advice from others, illness of family member, newspaper article, etc.).
6. Self-efficacy - This refers to the level of a person's confidence in his or her ability to successfully perform a behavior. This construct was added to the model most recently in mid-1980. Self-efficacy is a construct in many behavioral theories as it directly relates to whether a person performs the desired behavior.

While the Rh of a mother or woman is not a disease or illness in itself, the unwillingness to get tested or ascertain one's Rh compatibility with a partner before getting pregnant poses great danger to the mother, her fertility and her unborn children. In this sense, the HBM explains that the perceived benefits of ascertaining Rh compatibility before getting pregnant is responsible for the prevalence of Rh related conditions in Nigeria.

The criticism for HBM is that it assumes everyone has the same access to information on most health conditions but are unwilling to act in most cases.

### **Discussion of Key Issues**

The paper shows that knowledge on Rh incompatibility in Nigeria is poor. People are not aware of the issues surrounding Rh incompatibility especially as they choose their partners of get pregnant/undertake abortions. While it has been stabled that the Rh incompatibility risk for African women is 3 times higher than that of no-African women, there is an observed knowledge gap about this reality. Some factors responsible for this knowledge gap has been identified as ignorance, poverty, inability to see the benefits in ascertaining ones Rh before getting married or pregnant and religious beliefs. Studies reviewed in this paper have shown that ignorance is at the core of the inability or unwillingness to factor in Rh status by women while pregnant. The health belief model explains that the perceived susceptibility to a particular illness or disease informs people's decision to seek healthcare. Ignorance impedes the knowledge of the public on their susceptibility to Rh related complications. The cost of accessing healthcare is another significant factor influencing the knowledge of Rh incompatibility. Nigeria is largely a poor country without a robust health insurance policy for its citizens. This has placed the burden of healthcare solely on the patients' ability to pay cash off pocket every time they need to visit the hospital. This is a significant barrier that discourages knowledge of Rh incompatibility. Also, the affordability of healthcare is affected by poverty. Conditions that could be prevented with the use of drugs become complicated because of poverty. For instance, women whose Rh are incompatible with those of their newborns are expected to take doses of Rogam to keep the body safe for future conceptions. However, the cost of the drug hovers around 40,000-50,000 per shot. With a minimum wage of 33, 000 naira and a multidimensional poverty involving 133 million Nigerians (NBS, 2022), most people who need this drug are cannot afford it. Improved access to healthcare especially antenatal and postnatal healthcare can improve the knowledge of Nigerians about Rh incompatibility.

The prevalence of Rh incompatibility in Nigeria was seen to be on the high side. This points to a problem stemming from lack of knowledge. Studies show that there is a high prevalence rate of Rh incompatibility among African and Nigerian women more than women from other continents/countries. The three most common models by which a woman becomes sensitized towards a particular antigen of Rh are: a Fetal-maternal hemorrhage occurring due to abortion, childbirth, ruptures in the placenta during pregnancy, or medical procedures carried out during pregnancy that breaches the uterine wall and the reception of therapeutic blood transfusion. ABO blood group system and the D antigen of the Rhesus (Rh) blood group system typing are routine tests carried out prior to transfusion. The hemorrhage that occurs during abortion predisposes the women to sensitizations in their body, affecting subsequent conceptions. Unsafe abortions has been implicated as part of the reasons for high prevalence of Rh incompatibility in Nigeria. Abortion is illegal in Nigeria. However, people still get abortions done albeit in illegal and unsafe conditions. When abortions are done unsafely, they are likely to be done without recourse to Rh factors of the mother and the aborted fetus. Bolu and Weyimi (2016) insists that there is a high prevalence of Rh incompatibility and that this will keep rising if strategies are not put in place to reverse the trend. The dangers of the high prevalence rate of Rh incompatibility in Nigeria is its capacity to increase miscarriages and infertility among women in the country. On this note, literature suggests that Rh compatibility testing should be made compulsory before marriage and during pregnancy and abortions should be made legal and safer while access to maternal health care should further be liberalized by encouraging and expanding health insurance.

### **Conclusion**

The knowledge of Rhesus incompatibility in Nigeria is low as a result of factors like poverty, ignorance and lack of access to maternal healthcare. These factors have continued to increase

the prevalence rate of Rh incompatibility among the population resulting to risks and complications for conception. Also, mothers and babies are exposed to risks because of poor knowledge about the issue of Rh incompatibility. There is need to improve the knowledge about Rh incompatibility among Nigerians by public enlightenment and increasing access to maternal healthcare. It is important to also make it compulsory for women to ascertain the Rh compatibility with their would be partners/ spouses. This will reduce the risks associated with Rh complications.

### Recommendations

Based on the issues examined in this paper and the findings made, the following recommendations are made:

1. Rhesus compatibility testing should be made compulsory for intending couples and first time mothers to enable them ascertain their status and that of their partners and even babies. This will enable them make informed choices.
2. Health insurance should be made accessible and compulsory for citizens in order to tackle the challenges of poverty and lack of access to healthcare identified in the study. A compulsory health insurance scheme will make access to healthcare easy and affordable for Nigerians.
3. The cost of desensitization drugs like rogam should be brought down through subsidies by the government. This will enable more women to have access to it during childbirth.
4. Public enlightenment campaigns on Rh compatibility should organized in University campuses and markets by Non-Governmental Organizations (NGOs) to pass the message of Rh incompatibility to the public.
5. Rural healthcare providers should be trained on the issue of Rh computability to enable them advice their patients in the communities and villages appropriately.

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