

# Management of the Prevention of the Rhesus Alloimmunization: Case of the Mother-Child Hospital Dominique Ouattara of Bingerville/Ivory Coast/West Africa

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**How to cite this paper:** Ecra, A.T., Olou, L. and Konan, P. (2023) Management of the Prevention of the Rhesus Alloimmunization: Case of the Mother-Child Hospital Dominique Ouattara of Bingerville/Ivory Coast/West Africa. *Open Journal of Obstetrics and Gynecology*, 13, 1771-1782.

<https://doi.org/10.4236/ojog.2023.1311150>

**Received:** January 13, 2023

**Accepted:** November 4, 2023

**Published:** November 7, 2023

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## Abstract

**Introduction:** Perinatal mortality linked to fetal anemia of red cell alloimmunization in Côte d'Ivoire as in many developing countries can be explained by a lack of knowledge of Rhesus D feto-maternal alloimmunization, hence the obvious importance of carrying out a study on the problem of prevention of alloimmunization in rhesus negative births. This study takes stock of the management of this pathology in a reference hospital. **Results and Discussion:** Rh-negative mothers account for 6% of births, 42.7% (70/164) of women had a history of risk, about 61% of women had not had proper prophylaxis during previous pregnancies; and as many had not had follow-up of the coombs test during the current pregnancy; only 4.9% of patients had systematic prophylaxis with anti D serum at 28 weeks of pregnancy. This low rate of prevention is related to the financial difficulties of the patients, but also to a lack of knowledge of the pathology by the nursing staff. **Conclusion:** Good management of rhesus negative women during their pregnancy allows their incompatible child to benefit from all current treatments ensuring a healthy birth. It is therefore important for medical personnel to know how to deal with this rare disease in a small proportion of pregnant women.

## Keywords

Red Cell Alloimmunization, Prophylaxis, Pregnancy, Côte d'Ivoire

## 1. Introduction

Fetal-maternal red cell alloimmunization is a pregnancy pathology that refers to situations where the mother's blood type is Rh negative, but the fetus's blood type is Rh-positive. It is characterized by the presence in the mother's blood of alloantibodies Anti-D of the Ig G type which will cross the placental barrier, causing hemolysis of fetal red blood cells (hemolytic disease) [1]. Haemolytic disease of the fetus and newborn (HDFN) is caused by maternal alloimmunization against red blood cell antigens, which could result in fetal anaemia, hyperbilirubinaemia, kernicterus, and death [1] [2].

The number of children at risk of maternal alloimmunization is sometimes difficult to determine even in developed countries [3]. This proves even more complicated in our countries due to the absence of national registers, thus we apprehend the problem in anticipation, due to the inadequacy between the technical platform and the seriousness of the pathology [4].

Indeed, Ayodeji's study in Nigeria shows that rhesus alloantibodies are not those most involved during feto-maternal alloimmunization [5].

Perinatal mortality linked to situations of fetal anemia has significantly decreased in industrialized countries, through improvement in immunological and hematological techniques and transfusion management [6] [7].

In Côte d'Ivoire, as in most countries in Sub-Saharan Africa, many neonatal deaths could be linked to a lack of knowledge of Rhesus D feto-maternal alloimmunization, hence the obvious importance of carrying out a study on the problem of prevention of alloimmunization in rhesus negative births.

Very few data on feto-maternal anti-D alloimmunization in Côte d'Ivoire are available in the literature. However, the frequency of Rhesus negative individuals in the Ivorian population was evaluated at 14.2% of whole patients with negative rhesus with a female predominance, suggesting a risk of feto-maternal alloimmunization [8].

Given the importance of neonatal morbidity and mortality linked to rhesus D alloimmunization, we wanted to take stock of the management of this pathology in a reference care establishment: The Mother-Child Hospital Dominique Ouattara from Bingerville (MCH).

## 2. Methodology

The study took place in the gynecology department of the MCH and concerned all patients with negative rhesus whether followed or not at the MCH, but who gave birth in the maternity ward of the said establishment between April 2018 and June 2022, i.e., a period of 51 months.

A blood group is systematically requested from any patient giving birth in the hospital maternity ward.

Results are recorded in the physical or computerized patient file. Thus, all birth registers and computerized files were consulted exhaustively and the mothers of rhesus negative children were listed.

When information necessary for the study was missing, we called the patient on the telephone, and after explaining to her the purpose of our call, and obtaining her consent, we asked her the questions necessary for the investigation.

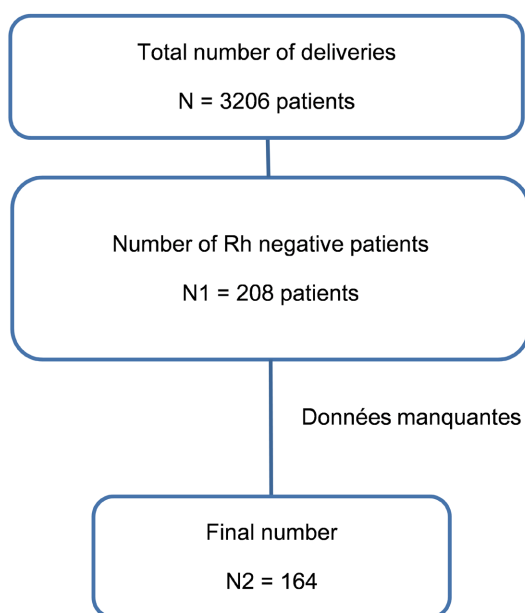
Patients who could not be reached by telephone were eliminated from the sample (**Figure 1**).

### 3. Results

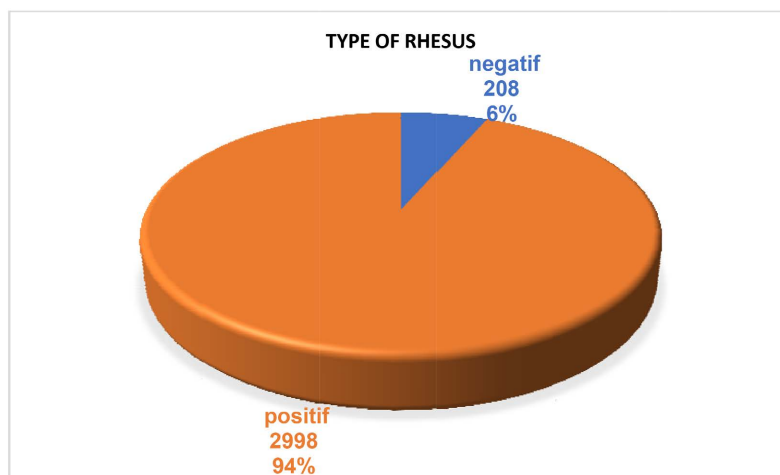
They are described with figures and tables in the prior paper sent.

### 4. Discussion

6% of our study population has a negative rhesus (**Figure 2**).



**Figure 1.** Flowchart of the study population.



**Figure 2.** Distribution of patients according to rhesus.

It therefore seems that there is a similarity in the frequency of Rh-negative people within black populations.

Alloimmunization is not directly linked to age; however, there are situations such as late-term pregnancies, where age may play a role in the risk of Rh alloimmunization [9].

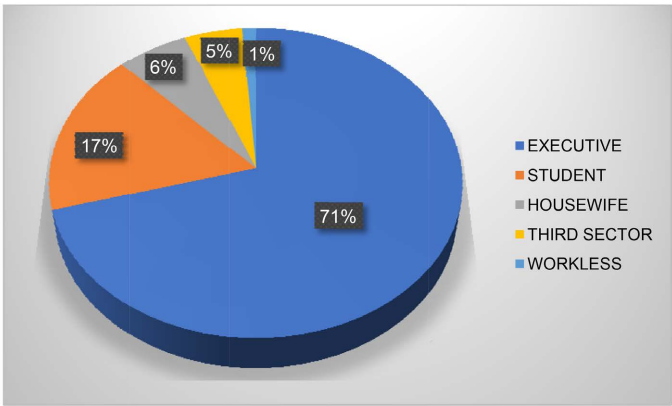
In our study, the average age was 30 years. The 30-39 age group was the most affected, with a rate of 60.4% (99/164) (Table 1). These results are contrary to those found by M. Konaré in Mali and A. Sanou in Mali, where the most common age group was between 15 and 20 years old with respective rates of 37.9% and 32.7 % [10] [11]. This could be explained by the fact that in Mali, marriages occur earlier than in Ivory Coast, thus exposing women to earlier childbearing. Indeed, according to their activityreport, Amnesty international gives in 2005 a rate of 83% of Malian girls married before the age of 18 while UNICEF in 2016 estimated this rate at 40% in Côte d'Ivoire.

There is no social predisposition to having a rhesus type. Executives with a percentage of 70.7% were the most frequent because the MCH is a private hospital, which implies a certain financial comfort (Figure 3).

**Table 1.** Distribution of patients by age.

Age	Percentage	
Number		
<19 years	5	3
20 - 29 years	55	33.6
30 - 39 years	99	60.4
40+	5	3
Total	164	100

The majority of patients are between 30 and 39 years old, or 60.4%; Mean age: 30 years  $\pm$  5.06.



**Figure 3.** Distribution of patients by occupation, Executives were the most frequent with a rate of 70.7% (116/164). Occupation: N = 164.

Paucigeste (2 or 3 children) represented 51.8% of the sampling. This result agrees with that of Mr. Konaré in Mali, who reported in his study a preponderance of paucigest with a rate of 56.7% [8] (**Table 2**).

Nullipara was the most represented in our study with a rate of 38.4%. The gap between the rate of multigest and that of multiparous is probably explained by the high frequency of clandestine abortions in Côte d'Ivoire; J. Benié *et al.* found in their study 43% of women having undergone a clandestine abortion [12] (**Table 3**).

A more recent study carried out by MPA2020 in 2018 showed an increase of around 7% [13]. As abortions are prohibited in Côte d'Ivoire, they are performed incognito, often by unqualified personnel, less informed about the prevention of rhesus alloimmunization, without prior blood testing to highlight a rhesus.

High-risk medical history indicates a higher likelihood of being at risk of alloimmunization in subsequent pregnancies. These generally concern previous pregnancies regardless of location and mode of termination.

In our study, 57.3% (94/164) of women had no history of risk of rhesus alloimmunization (**Figure 4**). Our result is lower than those of M. Konaré and A. Sanou in Mali who found rates of 79.4% and 74.04% respectively [10] [11]. This can be explained by early marriage which constitutes a certain protection against abortion.

During our study, anti-D serum wasn't administered to 49.4% of our study

**Table 2.** Distribution of patients by number of pregnancies.

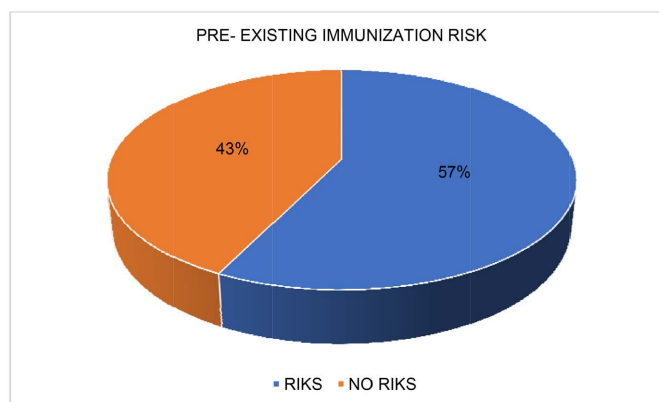
Gestité	Number	Percentage
Primigest	43	26.2
<b>Paucigest</b>	<b>85</b>	<b>51.8</b>
Multigest	36	22
Total	164	100

Primigestes and paucigestes represented more than 2/3 of patients; the pauci gestures are the most numerous with 51.8% (85/164) of the population.

**Table 3.** Distribution of patients by number of childbirth.

Parity	Number	Percentage
<b>Nulliparous</b>	<b>63</b>	<b>38.4</b>
Primipara	61	37.2
Pauciparous	39	23.8
Multiparous	01	0.6
Total	164	100

The nulliparous and the primiparous represented more than 2/3 of patients; the nulliparous represented 38.4% (63/164) of the study population.



**Figure 4.** Distribution of patients by history at risk 42.7% (70/164) of women had a history of risk (miscarriage, abortion, ectopic pregnancy). Obstetrical risk: N = 164.

population during previous pregnancies, and 12.8% were inconsistent in their prophylaxis.

This makes 62.2% of patients in our study who did not benefit from correct prevention.

This high rate of unrealized prevention can be explained by the fact that we listed all the patients who did not take anti-D serum, including those whose newborns were Rh negative (**Figure 5**).

Among the reasons for the non-adherence of anti-D serum, we note:

- Non-prescription of serum by nursing staff. The unavailability of this serum in certain pharmacies in provincial towns explains why this serum is not systematically prescribed. However, it is also necessary to mention the lack of knowledge on the management of maternal-fetal incompatibility.
- Financial reasons: some did not admit it for fear of reprimands from nursing staff.

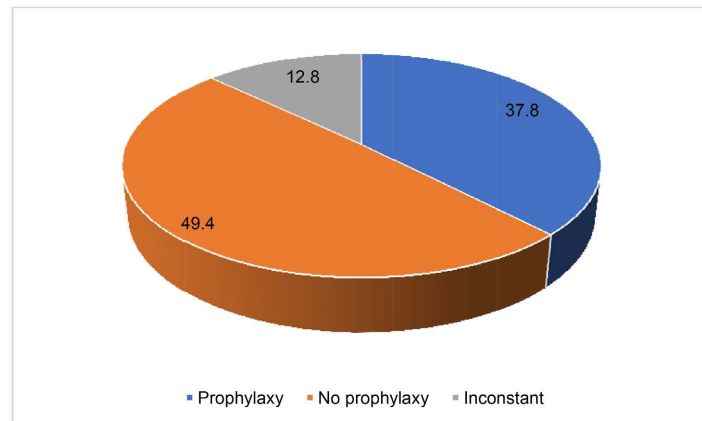
In our study, the outcome of the last pregnancies was normal in 89% (146/164) of cases; 5.5% of pregnancies resulted in neonatal deaths and neonatal anemia; but the cause of this neonatal anemia has not been investigated (**Figure 6**).

A significant number of women are not fortunate enough to have access to systematic prophylaxis in sub-Saharan Africa.

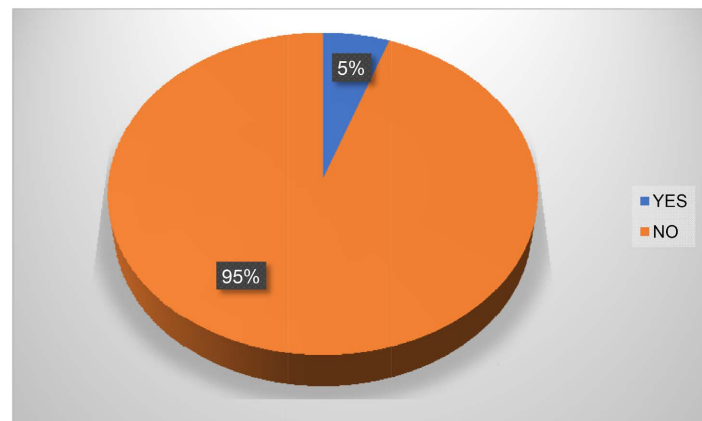
95.1% (156/164) of our study population had not carried out systematic prevention between the 28th and 36th weeks. Whereas in France, Sansey found only 22% of women who had not taken systematic prevention [14] (**Figure 7**).

Indeed, many practitioners in our countries do not prescribe anti-D serum either due to lack of information on feto-maternal incompatibility or because they are aware of the cost borne by patients. Indeed, antenatal prevention represents a double expense if the newborn is rhesus positive.

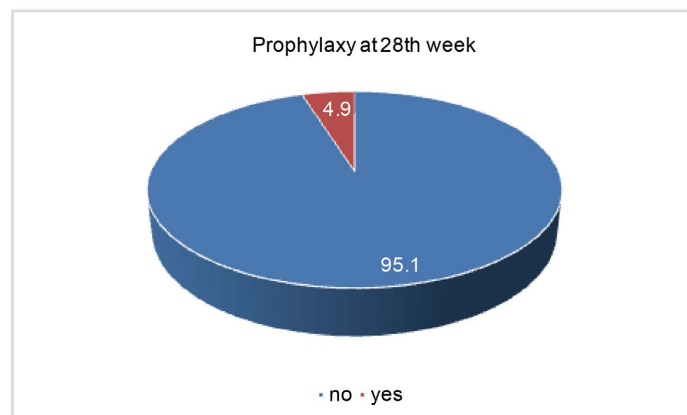
During our study, 75% (123/164) of women received postpartum anti-D prophylaxis. Our result is superimposable to that of Mr. Darlington in France, who found 69% of women in his population having received postpartum anti-D prophylaxis [15].



**Figure 5.** Distribution of patients by anterior prophylaxy 49.4% (81/164) of patients did not have anti D serum during prior pregnancy, “Inconsistent” refers to patients who have received prophylaxis during some pregnancies and not in others. Neonatal complications: N = 164; Management of prior pregnancies: N = 164.



**Figure 6.** Distribution of patients according to the concept of neonatal anaemia during a previous pregnancy. In 5% of patients, we found the notion of neonatal anemia during a previous pregnancy.



**Figure 7.** Distribution of patients according to prevention at 28 weeks of amenorrhea 4.9% (8/164) benefited from systematic prevention.

Generally speaking, social systems in developed countries allow for health care and therefore pregnancy, so the financial pressure is less strong; anti-D serum is reimbursed and medication adherence is therefore better.

In Mali, on the other hand, S. Doumbia and A. Sanou found respectively only 13.5% and 36.8% of women who had received postpartum anti-D prophylaxis [11] [16].

Better mastery of postpartum anti-D prophylaxis by the nursing staff at the Bingerville Mother-Child Hospital could explain this difference.

3.66% (6/164) of our patients whose newborns were Rh negative did not receive postpartum anti-D prophylaxis due to the occasional unavailability of anti-D serum on the one hand, and On the other hand, the mothers already had circulating antibodies for the disease.

This lack of immunization is detected by performing the indirect Coombs test. However, this test is only performed in 38.4% of cases in our patients (**Figure 8**).

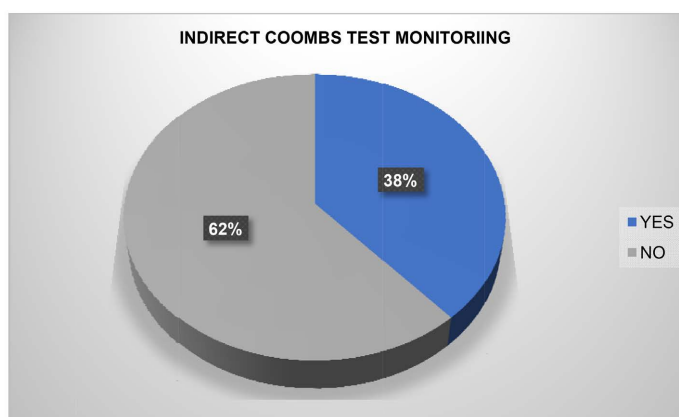
Among immune mothers, 5/8 women or 62.5% received anti-D serum unnecessarily.

Indeed, it was decided, given the high rate of non-performance of the indirect Coombs test during prenatal follow-up, to perform anti-D serum systematically. The benefit/cost is clearly in favor of the benefit. This attitude has resulted in staff no longer checking whether the Coombs test has been carried out or not.

During our study, all women received postpartum anti-D prophylaxis within 72 hours of delivery with a high frequency on day 0 of 64.23% (79/123). Our results are in line with the recommendations made in the literature, which demonstrates the professional health staff of the MCH.

At birth, the newborn's blood type and rhesus must be determined.

In many developed countries, blood typing is usually performed at birth as part of preventive health care and newborn screening programs, making rhesus blood typing a routine test [17].



**Figure 8.** Distribution of patients according to the indirect Coombs test 61.6% (101/164) of women did not perform the indirect Coombs test during pregnancy; Management of current pregnancies: N = 164; Systematic prevention at the 28th week with Anti-D serum; N = 164.



In developing countries, patients giving birth in private health facilities may have the rhesus blood type of their newborn; elsewhere, it is the negative rhesus of the mother which conditions the creation of the rhesus blood group of the newborn, when the material necessary for this grouping is available... Otherwise in the majority of cases, in developing countries, it is a contact with hospital services for any illness which will give the opportunity to determine the child's rhesus blood group.

During our study, newborns at birth were Rh positive in 78.7% (129/164) of cases. Our result is superimposable to that of A. Sanou in Mali who found 72.7% of newborns were rhesus positive. Our result is superior to those of S. Doumbia in Mali and W. El Khoulfi in France, who found respectively 59.6% and 63.53% of newborns who were rhesus positive [11] [16] [18].

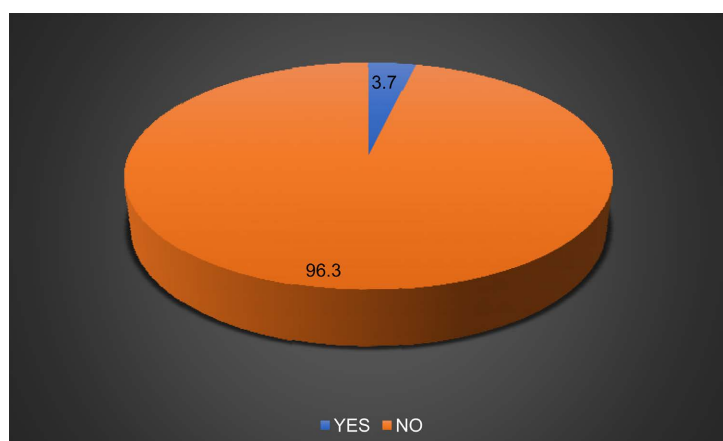
Our results agree with those of the literature. The figure 78% reflects the risk of alloimmunization.

Neonatal hemolytic disease (NHD) is usually caused by incompatibility of the mother's and baby's blood. It is clinically indicated by rapid and severe hyperbilirubinemia or persistent hyperbilirubinemia, and hemolysis on blood smear results [19].

Now, with emerging affordable technologies, global prevention and management of newborn jaundice can more easily reach those at risk, even in low-income settings [20] [21] [22] [23] [24].

Yet, there remains a lack of quality population-based data on hyperbilirubinemia prevalence and related outcomes to inform such a strategy for most countries [25].

During our study 3.7% (6/164) of newborns contracted NHD in the form of neonatal jaundice. Our rate is lower than those of C. Joubert in France and K. Monga in the Democratic Republic of Congo, who found that neonatal jaundice was the most common manifestation found in respectively 49 and 80% of immune mothers [26] [27] (**Figure 9**).



**Figure 9.** Distribution of newborn by jaundice 3.7% (6/164) of newborns had neonatal jaundice. N = 164.

This low figure for neonatal jaundice compared to the high rate of rhesus-positive newborns is perhaps also a reflection of low immunization among African women. The figures from the DRC could be the consequence of rhesus alloimmunization not followed regularly, of course, but in real contradiction with the apparent non-immunization of African women.

## 5. Conclusion

Good monitoring of rhesus negative women who are pregnant and/or have given birth should allow, in most cases, good management of their pregnancy, and allow their incompatible child to benefit from all current treatments ensuring a healthy birth with a normal long-term evolution. Although certain facts and studies argue in favor of a low rate of alloimmunization in the black population, the fact remains that this pathology has disastrous fetal consequences, and it should not be underestimated. It is important to introduce anti-D serum into the maternal and child care panel, and above all to provide initial and continuing training for medical personnel who are too often polarized with others, too often concerned about more frequent and less deadly pathologies.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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